

BEFORE THE
PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA

APPLICATION OF PALMETTO WASTEWATER RECLAMATION, INC. FOR AN
ADJUSTMENT OF ITS RATES AND CHARGES

DOCKET NO. 2021-153-S

DIRECT TESTIMONY
OF
AARON L. ROTHSCHILD

COST OF CAPITAL

ON BEHALF OF
SOUTH CAROLINA DEPARTMENT OF CONSUMER AFFAIRS

September 30, 2021

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I. STATEMENT OF QUALIFICATIONS

Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A. My name is Aaron L. Rothschild. My title is President, and my business address is 15 Lake Road, Ridgefield, CT.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am President of Rothschild Financial Consulting (“RFC”).

Q. PLEASE STATE YOUR EDUCATIONAL ACHIEVEMENTS AND PROFESSIONAL DESIGNATIONS.

A. I have a B.A. degree in mathematics from Clark University (1994) and an M.B.A. from Vanderbilt University (1996).

Q. PLEASE DESCRIBE YOUR BUSINESS EXPERIENCE.

A. I performed financial analysis in the telecom industry in the United States and Asia Pacific from 1996 to 2001, investment banking consulting in New York, complex systems science research regarding the power sector at an independent research institute, and I have prepared rate of return testimonies since 2002. See Appendix A for my resume.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA, OR OTHER STATE COMMISSIONS? IF SO, WHICH COMMISSIONS?

A. Yes, I have previously testified before the Public Service Commission of South Carolina (“Commission”). My expert witness experience also includes testifying in over 50 cost of

capital proceedings before the following state commissions: California, Colorado, Connecticut, Delaware, Florida, New Jersey, Maryland, North Dakota, Pennsylvania, and Vermont. See Appendix B for the list of dockets for each of my testimonies.

Q. ON WHOSE BEHALF ARE YOU PROVIDING THIS TESTIMONY?

A. I am testifying on behalf of the South Carolina Department of Consumer Affairs (“DCA”).

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to provide my recommendations to the Commission regarding the appropriate authorized return on equity (“ROE”), cost of debt, and capital structure for Palmetto Wastewater Reclamation, Inc. (“PWR” or “Company”).

Q. WHAT IS THE DIFFERENCE BETWEEN PWR’S COST OF EQUITY AND ITS AUTHORIZED ROE?

A. The cost of equity (“COE”) is the market-based return investors expect to earn on the market value of any given stock. As it applies to this proceeding, it is the return investors require to provide equity capital to PWR. The appropriate authorized ROE is based on the Commission’s determination of the COE at the time of the proceeding, after reviewing the evidentiary record, which incorporates investor expectations. Once the Commission issues an authorized ROE, the market-based cost of equity will continue to fluctuate as capital markets inevitably continue to change. The authorized ROE is based on a snapshot of the COE, which is constantly changing.

Q. PLEASE DEFINE THE APPROPRIATE RATE OF RETURN.

A. The appropriate Rate of Return (ROR) is based upon the weighted overall cost of capital (WACC) of the current cost of debt and equity at the time of this proceeding. The weighted cost rate is calculated by multiplying the capital structure ratios of the sources of capital (debt, preferred equity, and equity) times respective cost rates.

$$\text{WACC} = \text{Cost of Debt} \times \text{Debt Ratio} + \text{COE} \times \text{Common Equity Ratio}.$$

Q. HAVE YOU REVIEWED PWR'S APPLICATION AND DIRECT TESTIMONY?

A. Yes.

II. INTRODUCTION AND SUMMARY OF CONCLUSIONS

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. First, I provide a summary of my recommendations, an overview of cost of equity concepts, and how current capital markets relate to my cost of equity calculations. Second, I provide a more detailed discussion of current capital markets. Third, I provide a detailed explanation of the various models I use in my cost of equity calculations. Lastly, I provide an evaluation of PWR's rate of return testimony.

Q. PLEASE PROVIDE A SUMMARY OF YOUR RECOMMENDATIONS.

A. I recommend the following cost of capital for PWR's wastewater operations:

- An overall cost of capital of 5.22% (4.64% - 5.42%)¹
- An ROE of 7.31% (6.13% - 7.70%)

¹ Using Mr. Moul's capital structure of 59.92% common equity would result in a cost of capital of 4.94% to 5.88%.

- A capital structure containing 49.26% common equity and 50.74% debt
- A debt cost rate of 3.20%

A summary of my cost of capital recommendations for PWR's wastewater operations is presented in Table 1 below.

TABLE 1: ALR RECOMMENDED RANGE MIDPOINT - PALMETTO WASTEWATER RECLAMATION, INC. Docket No. 2021-153-S			
	Capital Structure Ratios	Cost Rate	Weighted Cost Rate
Long-Term Debt	50.74%	3.20%	1.62%
Short-Term Debt	0.00%	0.00%	0.00%
Preferred Equity	0.00%	0.00%	0.00%
Common Equity	49.26%	7.31%	3.60%
Rate of Return			5.22%

Exhibit ALR-1

Q. ARE YOU RECOMMENDING A SPECIFIC ROE OF 7.31% OR AN ROE RANGE OF 6.13% TO 7.70%?

A. I recommend both a range of appropriate ROEs and a specific point within that range that I feel would be the most appropriate. As I explained in the hearings in the recent Blue Granite Water Company case,² applying the various COE models results in a range for the true COE and not a precise number. The range of 6.13% to 7.70% that I recommend already eliminates the extreme ends of the results of my models and reflects the range of ROEs I feel confident will allow PWR to raise the capital it needs to provide safe and reliable service. However, I also recommend a specific point of 7.31% within that range because commissions have often requested this specifically.

² Docket No. 2019-290-WS Evidentiary Hearings Transcript, pg. 720.

1 **Q. WHY ARE YOU RECOMMENDING AN ROE OF 7.31% INSTEAD OF 6.92%,**
2 **WHICH IS THE MIDPOINT OF YOUR COE MODEL RESULTS**
3 **RECOMMENDED RANGE?**

4 **A.** As discussed below, numerous recent authorized ROEs for water and electric utilities have
5 been between 7.36% and 7.90%, including an ROE of 7.46% for Blue Granite Water
6 Company.³ It is encouraging for consumers and the general public that commissions are
7 authorizing ROEs that are more in line with the market-based COE. I am recommending
8 a 7.31% ROE for PWR instead of the 6.92% midpoint of my recommend range because I
9 believe it is prudent to not be overly abrupt while bringing ROEs in line with the true
10 market-based COE. However, as discussed above, I provide a recommended ROE range
11 of 6.13% to 7.70% so that the Commission can ultimately decide what ROE they believe
12 is appropriate given the evidence presented in the record.

13 **Q. PLEASE PROVIDE A SUMMARY OF HOW YOUR COST OF EQUITY**
14 **RECOMMENDATION COMPARES TO RETURN EXPECTATIONS OF MAJOR**
15 **FINANCIAL INSTITUTIONS.**

16 **A.** My cost of equity recommendation of 7.31% (6.13% to 7.70%) for PWR is in the middle
17 of the range of the expectations published by major banks and brokerage houses (5.5 to
18 8.5%) shown in Table 2 on page 6. My recommendation is consistent with the cost of
19 equity demanded by investors and enables PWR to raise the capital needed to provide safe
20 and reliable service.

³ Docket No. 2019-290-WS.

TABLE 2: U.S. EQUITY RETURN EXPECTATIONS AMONG MAJOR FINANCIAL INSTITUTIONS	
Duff & Phelps (December 2020) [1]	8.0%
Horizon Actuarial Services, LLC Survey - 20 Year Horizon (August 2021) [2] 50% Percentile: 6.9%	4.6 - 8.9%
J.P. Morgan Asset Management - Equity Long-Term Returns (Sep 2020) [3]	4.1%
Charles Schwab - 10-year U.S. Large Cap Returns (May 2021) [4]	6.6%

Dates above indicate latest market-data used in analysis.

Sources:

[1] Duff & Phelps Recommended U.S. Equity Risk Premium Decreased from 6.0% to 5.5%, Effective December 9, 2020

[2] Horizon Actuarial Services, LLC, Survey of Capital Market Assumptions Survey, August 2021, page 17.

Survey participants Include: Bank of New York Mellon, BlackRock, Goldman Sachs Asset Management, J.P. Morgan Asset Management, Merrill, Morgan Stanley Wealth Management, Royal Bank of Canada, UBS.

[3] J.P. Morgan Asset Management - 2021 Long-Term Capital Market Assumptions

September 30, 2020. Page 77.

[4] Charles Schwab - Why Market Returns May Be Lower and Global Diversification More Important in the Future
May 3, 2021.

The data shown in Table 2 above shows that major financial institutions are informing their clients to expect returns on their investments similar to the cost of equity I propose in this testimony. The return expectations published by all these financial institutions are based on their own financial models and are broadly for the overall stock market (e.g., US Large Cap, S&P 500). My cost of equity recommendation is based on government-regulated water utility companies only. Given the relatively lower risk associated with monopoly utilities, it is unlikely that investors would expect to earn a higher return for a utility company than for the overall stock market.

Q. PLEASE COMPARE YOUR ROE RECOMMENDATION TO THE ROE REQUESTED BY PWR.

A. I recommend a different ROE⁴ for PWR than its witness Mr. Moul for many reasons.

First, Mr. Moul does not use the most current market data (e.g., stock prices, interest rates). His analysis only includes data up until April 30, 2021 despite filing his testimony on September 2, 2021. This is particularly concerning because water utility stock prices

⁴ My ROE recommendation is based on PWR's current market-based COE. As stated previously, the authorized ROE is based on a snapshot of the COE which is constantly changing. In the context of this case my recommended COE and ROE are synonymous.

1 have significantly increased over that time period (up 25.9% in the six month period of
2 March through August 2021) indicating a lower cost of equity, and interest rates have
3 declined indicating a lower cost of debt.

4 Second, we have fundamentally different analytical approaches. I focus primarily
5 on using market data (e.g., stock prices, bond yields, stock option prices) to measure
6 investors' expectations as much as possible. On the other hand, Mr. Moul relies also on
7 non-market data, including economists' projections (e.g., interest rates) and analysts'
8 forecasts (e.g., 5-year earnings per share growth), to inflate his results.

9 Third, as discussed below, Mr. Moul makes inappropriate adjustments (i.e.,
10 leverage and size adjustments) to his model results that go against regulatory principles
11 and the results of recent research.

12 The ROE recommended by Mr. Moul and requested by PWR is 10.95%. As shown
13 in Table 2 on page 6, his requested ROE is considerably higher than return expectations
14 published by major consulting firms, brokerage houses, and market data publications (4.1%
15 to 8.9%). As I will explain further in my testimony, PWR's witness's ROE
16 recommendation is above current investor expectations for numerous reasons, including
17 flaws in his models and his decision to not rely on investors' interest rate forecasts
18 incorporated in current market yields. As explained in more detail herein, Chart 10 on page
19 59 shows that the non-market-based interest rate forecasts used by Mr. Moul have not been
20 accurate. Furthermore, analysts' earnings forecasts used by PWR's witness's discounted
21 cash flow (DCF) analyses have been shown to be overly optimistic.⁵

⁵ Marc H. Goedhart, Rishi Raj and Abhishek Saxena, Equity Analysts: Still too bullish, Spring 2010.

Determining the appropriate cost of capital is a delicate balance. If the COE and overall cost of capital is set too low, PWR will not be able to access the capital needed to provide safe and reliable service. However, charging consumers above the current market rate for capital is not appropriate or necessary to assure capital is available and will result in an unjustified windfall to PWR. Mr. Moul's 10.95% cost of equity recommendation is well above the equity return expectations of the financial industry. His cost of equity recommendation is also considerably above allowed returns in the following recent electric and water rate cases:

- **7.90%** - On September 1, 2021, the Connecticut Public Utilities Regulatory Authority Public determined that effective November 1, 2021, Eversource's authorized ROE will be 7.90%.⁶
- **7.46%** - On April 9, 2020, this Commission authorized a ROE of 7.46% for Blue Granite Water Company (Docket No. 2019-290-WS).⁷ This decision was upheld by the South Carolina Supreme Court.⁸
- **7.36%** - In Illinois Commerce Commission Docket No. 21-0365 Ameren Illinois proposed a 7.36% ROE in its formula rate update.⁹ Note- Formula rates set in Illinois are based on a formulaic ROE calculation (current yield on 30-year U.S. Treasury plus 580 basis points).
- **7.36%** - In Illinois Commerce Commission Docket No. 21-0367 ComEd proposed a 7.36% ROE in its formula rate update.¹⁰ Note- Formula rates set in Illinois are

⁶ Docket No. 17-10-46RE03, Proposed Interim Decision, page 27.

⁷ Docket No. 2019-290-WS – Order No. 2020-306, page 38.

⁸ Opinion No. 28055, Heard June 15, 2021 – Filed September 1, 2021.

⁹ “Lowest equity return on record to be used in Ameren Illinois’ newest rate case”, RRA Regulatory Focus, April 16, 2021.

¹⁰ “Fitch Rates Commonwealth Edison’s First Mortgage Bonds ‘A’”, Fitch Ratings, August 5, 2021.

based on a formulaic ROE calculation (current yield on 30-year U.S. Treasury plus 580 basis points).

My market-based analysis indicates that the ROE I recommend for PWR is sufficient to attract capital. As shown in Table 3 below, Mr. Moul and I have different cost of debt, capital structure and cost of equity recommendations. My 7.31% cost of equity recommendation results in a 5.22% overall rate of return. Mr. Moul's 10.95% cost of equity recommendation results in an overall rate of return of 8.08%.

TABLE 3: RECOMMENDATION COMPARISON - ROTHSCILD AND MOUL					
	Cost of Equity	Cost of Debt	Common Equity %	Debt %	Rate of Return
Rothschild [1]	7.31%	3.20%	49.26%	50.74%	5.22%
Moul [2]	10.95%	3.79%	59.92%	40.08%	8.08%

[1] Exhibit ALR-1

[2] Mr. Moul's Direct Testimony, Exhibit PRM-1, Schedule 1, page 1 of 2

If my 7.31% COE is used to set rates for PWR, the rate of return portion of the revenue requirement will be about \$0.7 million. On the other hand, if Mr. Moul's 10.95% cost of equity recommendation is used to set rates, the rate of return portion of the annual revenue requirement will be about \$1.2 million. As shown in Table 4 on page 10, if Mr. Moul's rate of return recommendations are adopted instead of mine, consumers will pay approximately \$0.5 million more per year.

TABLE 4: ANNUAL REVENUE IMPACT VS. REQUESTED - PALMETTO WASTEWATER RECLAMATION, INC.

(\$ million)

	Rate of Return Portion of Revenue Requirement	Difference PWR Rothschild
Rothschild	\$0.71	
PWR Request	\$1.18	\$0.47

Inputs:

Requested Rate Base [1]	\$11.52
Federal income tax rate	21.00%
State income tax rate	5.00%
[1] PWR's Application, Schedule F and G.	

Q. IS IT APPROPRIATE TO ALLOW PWR AN AUTHORIZED ROE BASED ON THOSE ALLOWED IN OTHER JURISDICTIONS?

A. As explained below, PWR's authorized ROE should be market-based. In other words, it should be based on investors' return expectations as indicated by current market data. Even if it were assumed that all historical authorized ROEs of wastewater or water utility companies in other jurisdictions are based on accurate market-based cost of equity calculations, they are from the past. The cost of equity should be based on current market conditions. Setting rates based on historical data is like driving a car by looking out the rear-view mirror. Calculating the cost of equity while looking backward is particularly ineffective now because COVID-19 caused significant capital market disruption through most of 2020, and the recovery is happening in real time. Unless authorized ROEs are set based on investors' current expectations as indicated by market data at the time of the proceeding, the resulting rates would either be too low to permit a utility to raise capital on reasonable terms or too high so that ratepayers would be overcharged. For these reasons, I strongly recommend using the results of my market-based methods as confirmed by the equity return expectations of leading financial institutions shown in Table 2 on page 6.

1 **Q. YOU MENTIONED ABOVE THAT SOME RECENT AUTHORIZED ROES HAVE**
2 **BEEN BETWEEN 7.36% AND 7.90%. SHOULD THESE AUTHORIZED ROES**
3 **GIVE THE COMMISSION COMFORT THAT YOUR RECOMMENDED 7.31%**
4 **ROE WILL ALLOW PWR TO RAISE THE CAPITAL REQUIRED TO PROVIDE**
5 **SAFE AND RELIABLE SERVICE?**

6 **A.** Yes. As discussed above, it is encouraging for consumers and the general public that
7 commissions are authorizing ROEs that are more in line with the market-based COE.
8 Understandably, I have seen intense pushback from utility companies regarding these
9 lower ROEs because it is their job to grow earnings as much as possible.

10 Should authorized ROEs continue to become more in line with the market-based
11 COE, it is critical that we continue to analyze the data (e.g., stock prices, credit ratings) to
12 ensure that utility companies have access to capital to provide safe and reliable service.

13 **Q. YOU RECOMMEND THAT PWR SHOULD BE AUTHORIZED TO EARN AN**
14 **ROE EQUAL TO ITS MARKET-BASED COST OF EQUITY OF 7.31% (6.13% TO**
15 **7.70%). PLEASE DEFINE THE COST OF EQUITY.**

16 **A.** The cost of equity is the return investors expect to earn when they purchase the equity (or
17 stock) of a company. The return investors expect can come in the form of capital gains
18 (stock price appreciation) or dividend payments. As investors buy and sell stock in the
19 market, they convey information about their return expectations and therefore the
20 underlying cost of equity (companies with different risk profiles will have different costs
21 of equity). It is impossible to determine the cost of equity based on accounting information
22 alone (e.g., revenue, net income, equity book value, or return on book equity) as it can only
23 be established by the stock market.

1 It is important that the cost of equity used to set rates for PWR in this proceeding
2 be market-based. This makes sense because investor-owned utility companies (“IOUs”)
3 raise money from investors. It is thus critical that the authorized ROE be consistent with
4 the market return expectations of investors. If the authorized ROE is below investors’
5 market return expectations, PWR will not be able to raise the capital required to provide
6 safe and reliable service. On the other hand, if the allowed return is above investors’ market
7 return requirements, PWR’s consumers will be paying more than necessary for their
8 service.

9 **Q. DO ANY ROE WITNESSES USE A DIFFERENT DEFINITION FOR THE COST**
10 **OF EQUITY?**

11 **A.** Yes. All ROE witnesses I have encountered over my more than 20 years in the industry,
12 including Mr. Moul, the ROE witness in this proceeding, define the cost of equity as
13 market-based somewhere in their testimony. Mr. Moul refers to his DCF, CAPM and RPs
14 methodologies as “market-based models”. However, many of those witnesses, including
15 Mr. Moul, implicitly define the cost of equity, at least in part, as a hybrid of accounting
16 returns (return on book equity) and return expectations of “expert forecasters” such as
17 economists and equity analysts. This characterization of the cost of equity as largely
18 subjective is erroneous and it makes it more challenging for a commission to make an
19 informed decision.

20 **Q. IS YOUR MARKET-BASED COST OF EQUITY RECOMMENDATION BASED**
21 **ON YOUR OPINION OF FUTURE STOCK PRICE RETURNS?**

22 **A.** No. I do not pretend to be able to predict the future. Capital markets are unpredictable and
23 as explained above, it is investors’ expectations that matter since they are the ones

1 providing the capital. Therefore, I provide an expert evaluation of investors' return
2 expectations as indicated by the current market prices of stocks, bonds, and stock options,
3 without attempting to predict future prices. This is an important topic that I will revisit
4 throughout my testimony.

5 I do use Value Line and Zacks¹¹ forecasts to estimate the market-based cost of
6 equity in my Discounted Cash Flow (DCF) analyses. However, I do not use them
7 mechanically and I go to great lengths to distill the sustainable growth component to ensure
8 it is in line with investors' long-term expectations. My Capital Asset Pricing Model
9 (CAPM) is based on a direct measurement of investors' expectations as indicated by market
10 prices instead of analyst forecasts.

11 **Q. PLEASE SUMMARIZE HOW YOU DETERMINED YOUR COST OF EQUITY**
12 **RECOMMENDATION OF 7.31% (6.13% TO 7.70%) FOR PWR'S**
13 **WASTEWATER OPERATIONS.**

14 **A.** To arrive at my recommendation, I applied the Constant Growth and Non-Constant Growth
15 versions of the DCF and 8 variations of the CAPM methodologies to a proxy group of 7
16 publicly traded water utility companies ("RFC Water Proxy Group") using data available
17 through August 31, 2021. To be conservative, I did not take into account the results of the
18 Non-Constant Growth version of the DCF in arriving at my cost of equity recommendation
19 because the results for several of the companies in my proxy group were below their cost
20 of debt. As discussed below, I review capital market data in general and the model results

¹¹ In this case I do not rely on Zacks growth forecasts because they provide data for only 2 of the 7 companies in my proxy group. If I incorporated the limited Zacks data it would result in a lower ROE recommendation.

1 of leading financial institutions as an additional check on the reasonableness of my model
2 results.

3 **Q. ARE YOUR COST OF EQUITY MODELS BASED ON ESTABLISHED**
4 **METHODOLOGIES?**

5 **A.** Yes. The purpose of my testimony is to provide the Commission with an independent
6 analysis. However, I do not reinvent the wheel. It is mostly a question of which established
7 methodologies and theories are best to use. There are countless established methodologies
8 and theories used by investors, scholars, and rate of return witnesses. Further, finance does
9 not stand still and can be affected by numerous factors. For example, Wall Street traders
10 have been increasingly using machine learning to make investment decisions, and the use
11 of quantum computing is likely the next new tool.

12 The Constant Growth DCF model I use is the same one chosen by major financial
13 institutions. For example, J.P. Morgan Chase uses the same sustainable growth form of
14 the DCF method in its 2019 Long-Term Capital Market Assumptions publication.¹²
15 *Principles of Corporate Finance*, a leading financial textbook used in business schools and
16 investment banks around the world, recommends using the very same method I use to
17 calculate the cost of equity for regulated utility companies.¹³ As discussed in Section V.
18 Capital Asset Pricing Model on page 54, my CAPM is based on methodologies used by
19 Value Line, the Chicago Board of Options Exchange (CBOE), and published in peer-
20 reviewed academic journals (e.g., *The Review of Financial Studies*).

¹² 23rd Annual Edition, Long-Term Capital Market Assumptions - Time-tested projections to build stronger portfolios, pp. 62-63.

¹³ Brealey, Myers, and Allen (2017), *Principles of Corporate Finance*, 12th Edition, McGraw-Hill Irwin, New York, page 86-87.

1 My market-based methodology has also been recognized by this and other state
2 commissions. On September 14, 2021, the Connecticut Public Regulatory Authority stated
3 the following:

4 The Authority finds Rothschild's market-based approach for determining a
5 reasonable ROE to be credible and persuasive. Specifically, the Authority
6 finds that the incorporation of investor market return expectations into the
7 historically applied DCF and CAPM methodologies enables the Authority,
8 and all docket participants, to better consider a just and reasonable rate of
9 return based on the same prospective basis that base distribution rates are
10 set. As such, the Authority determines that this added layer of analysis
11 provides appropriate protection to the relevant public interests, both existing
12 and foreseeable, pursuant to Conn. Gen. Stat. § 16-19e(a). Therefore, the
13 Authority considered Rothschild's DCF and CAPM calculations, as
14 outlined below, in this Decision; moreover, on a going forward basis, the
15 Authority shall consider a similar approach to incorporating investor
16 expectations into the historically applied DCF and CAPM methodologies in
17 all future rate proceedings.¹⁴

18 In California's 2017 Water Cost of Capital proceedings, a company witness
19 acknowledged the validity of RFC's method. California ALJ Bemserderfer stated the
20 following:

21 ...on cross-examination Vilbert [California Water Service Company
22 witness] admitted that Rothschild's use of the method [b x r method] was
23 "reasonable" and that Rothschild had "implemented the methodology
24 correctly" in arriving at his Water Proxy Group ROE of 8.25%.¹⁵

25 On April 9, 2020, this Commission stated the following:

26 Amongst the three witnesses, Consumer Affairs Rothschild's approach was
27 unique in that he included the use of both historical and forward-looking,
28 market-based data in his analysis. Based on the testimony and facts
29 presented, the Commission therefore adopts the recommended ROE of
30 7.46% proposed by witness Rothschild.¹⁶

¹⁴ Proposed Interim Decision of the Connecticut Utilities Regulatory Authority, Docket No. 17-10-03RE11, page 21, September 14, 2021.

¹⁵ Proposed Decision of ALJ Bemserderfer, Application 17-04-001, Agenda ID #16274 Ratesetting, page 19, February 6, 2018.

¹⁶ Order Ruling on Application for Adjustment in Rates, Blue Granite Water Company, Docket No. 2019-290-WS, Order No. 2020-306, April 9, 2020, page 43.

Q. PLEASE SUMMARIZE THE RESULTS OF YOUR COST OF EQUITY MODELS.

A. I have determined the cost of equity for the average company in my RFC Water Proxy Group to be between 6.13% and 7.70%.¹⁷ As shown in Table 5 below, the high-end results of my cost of equity models, including eight variations of the CAPM, range between 6.03% and 8.15%, with an upper quartile at 7.70%. The low-end results of my cost of equity models range between 5.80% and 8.05%, with a lower quartile at 6.13%.

TABLE 5: COST OF EQUITY MODEL RESULTS		
DCF	Low	High
Constant Growth	8.05%	8.15%
Non-Constant Growth (Excluded from Recommendations)	5.80%	6.03%
CAPM		
Spot (Aug. 31, 2021)		
Risk Free Rate - 3-Month T Bill	6.22%	6.22%
Risk Free Rate - 30-Yr T Bond	6.81%	6.81%
3-Mo. Weighted Average (Jun. to Aug. 2021)		
Risk Free Rate - 3-Month T Bill	6.04%	6.76%
Risk Free Rate - 30-Yr T Bond	6.68%	7.25%
Outer Quartile Range (Excluding NCGDCF)	6.13%	7.70%
Midpoint of Range	6.92%	

Exhibit ALR-2

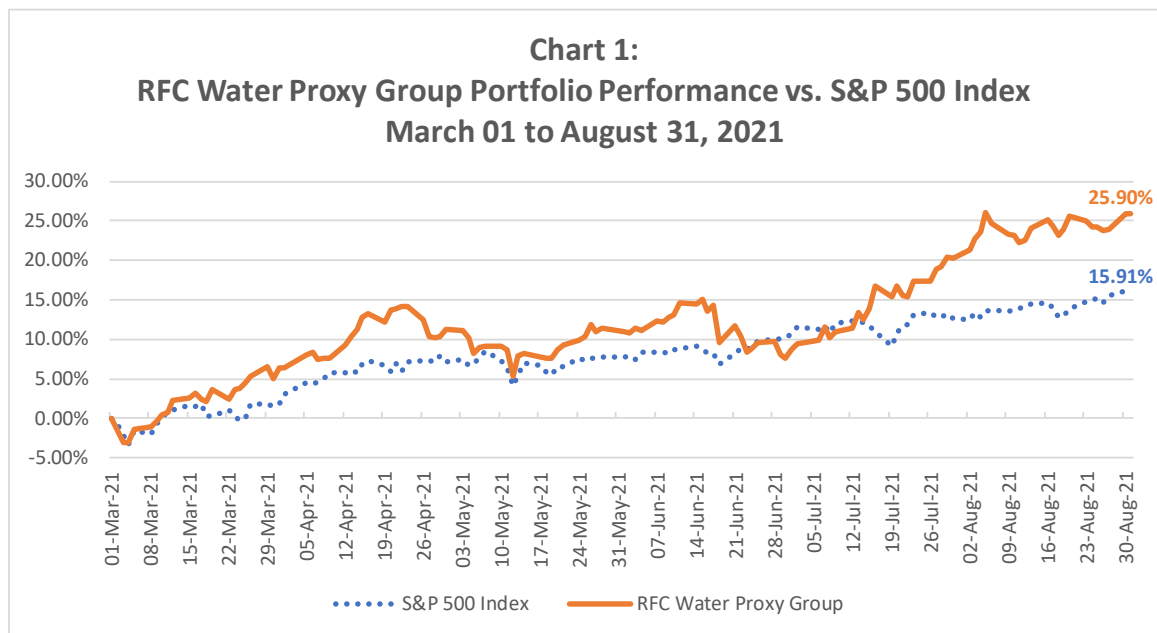
Q. WHAT DOES CAPITAL MARKET DATA INDICATE REGARDING HOW THE COVID PANDEMIC HAS AND IS INFLUENCING THE COST OF EQUITY?

A. Market data show that in the early stages of the COVID pandemic, capital market risks increased but have since declined to approximately pre-pandemic levels, as elaborated upon below.

¹⁷ Exhibit ALR-2.

Q. PLEASE EXPLAIN WHAT MARKET DATA SHOW REGARDING HOW INVESTORS' PERCEPTION OF WATER UTILITY EQUITY RISK WAS IMPACTED BY THE COVID PANDEMIC.

A. As shown in Chart 1 below, the prices of the water utility stocks in my RFC Water Proxy Group have been significantly outperforming the overall market over the past six months, which indicates that the cost of equity has likely been decreasing.



Additionally, forward-looking (option-implied) betas¹⁸ for the RFC Water Proxy Group are lower than before the pandemic, which also indicates that PWR's cost of equity has been decreasing. As shown in Chart 11 on page 62, the average option-implied beta for the 7 companies in my proxy group was 0.79 in pre-pandemic market conditions in December 31, 2019 and spiked to almost 1.0 during the spring 2020 initial phase of the pandemic. But the average forward beta has remained mostly under 0.7 since then (with a

¹⁸ As discussed below, beta is a measure of a security's sensitivity to movements in the overall market. A beta of 1 indicates a COE equal to the overall market while a beta higher or lower than 1 indicates a COE higher or lower than the overall market respectively.

1 few brief exceptions), with a value of 0.69 as of August 31, 2021. These lower betas
2 indicate that the cost of equity for water utility stocks has decreased since the initial
3 outbreak of the pandemic and point to a lower cost of equity than before the pandemic.

4 Table 6 on page 19 shows a summary of how COVID-19 has impacted financial
5 markets between December 31, 2019 and August 31, 2021. Line 1 of Table 6 shows how
6 the overall stock market (S&P 500) sharply declined during the initial spread of COVID-
7 19, but has fully recovered and is regularly reaching new highs. Line 2 shows that interest
8 rates initially declined sharply (30-year U.S. Treasury yields fell from 2.39% to a low of
9 1.17% on April 24, 2020), bounced back by March 2021, and have since once again gone
10 down considerably below (1.92%) pre-pandemic levels. As shown on line 3, in March
11 through December 2020, investors were demanding an increased credit spread to invest in
12 riskier corporate bonds (151 basis point increase from December 2019 to March 2020), but
13 credit spreads have since come down to below pre-pandemic levels. Line 4 shows that
14 investors' volatility expectations as measured by the Market Volatility Index (VIX)
15 increased significantly from 13.78 on December 31, 2019 to 75.91 in March 2020 but have
16 since come back down considerably to 16.48 as of August 31, 2021. Line 5 shows that
17 stock option prices indicate that the equity risk premium, which also peaked in March and
18 April 2020, has since come down but remains somewhat elevated when compared to pre-
19 pandemic levels. Lastly, as shown on line 6 of Table 6 and Chart 11 on page 62, option-
20 implied betas for my RFC Water Proxy Group, which peaked in February 2020, have since
21 decreased to levels below those before the pandemic (0.69 on August 31, 2021 vs. 0.79 on
22 December 31, 2019), indicating that investors expect water utility stock price movements

to be less correlated with the overall market than before the pandemic and therefore to be less risky relative to the market.

TABLE 6: COST OF EQUITY IN TODAY'S FINANCIAL MARKET - SUMMARY
MEASURING COVID-19'S IMPACT ON THE COST OF EQUITY

	Dec '19	Feb '20	Mar '20	Jun '20	Sep '20	Dec '20	Mar '21	Jun '21	Aug '21	
										Dec '19 - Aug '21 Delta
	Pre-Crisis	COVID-19 Crisis								
		Mkt Peak	Trough	"Recovery"						
1. Stock Prices (S&P 500)	\$3,231	\$3,386	\$2,529	\$3,100	\$3,363	\$3,756	\$3,973	\$4,298	\$4,523	\$1,292
Growth Since 12/31/19		4.8%	-21.7%	-4.0%	4.1%	16.3%	23.0%	33.0%	40.0%	
2. Interest Rates (30-Yr) [1]	2.39%	2.01%	1.63%	1.41%	1.46%	1.65%	2.41%	2.06%	1.92%	-0.47%
3. Credit Spreads (Baa vs. 10-Yr) [2]	1.98%	2.05%	3.49%	2.93%	2.75%	2.18%	2.03%	1.87%	1.94%	-0.04%
4. Volatility Expectations (30-Day) [3]	13.78	14.38	75.91	30.43	26.37	22.75	19.40	15.83	16.48	2.70
5. Market Risk Premium [4]	4.56%	4.99%	10.71%	9.14%	10.21%	8.42%	7.27%	6.85%	7.12%	2.55%
6. RFC Water Proxy Group - Fwd. Beta (6-Mo.) [5]	0.79	0.87	0.61	0.54	0.57	0.61	0.66	0.75	0.69	-0.10

[1] 30-year U.S. Treasury Yield

www.treasury.gov

[2] Baa rated corporate bond yield - 10-year U.S. Treasury Yield

<https://fred.stlouisfed.org/series/BAA>

<https://fred.stlouisfed.org/series/GS10>

[3] VIX Index - 30 days

[4] Annualized option-implied market risk premium vs. 30-year Treasury RFR - weighted across all traded expirations as of last Tuesday before date, assuming 50.0% cumulative probability (median)

[5] Option-implied beta - 6-month, as of last Tuesday before date

Exhibit ALR-4

Q. PLEASE DEFINE YOUR ANALYTICAL APPROACH?

A. My COE recommendation is my opinion of the return investors require to provide equity capital to PWR based on current capital markets. My recommendation is consistent with the following legal standards set by the United States Supreme Court for a fair rate of return:

The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks.¹⁹

And

¹⁹ *Federal Power Commission v. Hope Natural Gas Company* 320 U.S. 591, 603 (1944).

1 ...sufficient to...support its credit and...raise the money necessary for the
2 proper discharge of its public duties.²⁰

3 Because the cost of equity is not a published figure like a bond yield, some
4 interpretation is required to determine the appropriate market price. My COE
5 recommendation is based on my computation of what the market indicates investors require
6 (return on investment) to provide capital to companies with comparable risk to PWR.

7 As explained below, I use current market prices (e.g., stocks, bonds, options), which
8 measure investors' expectations directly, to determine the cost of equity, instead of relying
9 solely on historical data and analyst forecasts.

10 **III. COST OF EQUITY IN TODAY'S FINANCIAL MARKETS**

11 **Q. HOW DO RECENT FINANCIAL MARKET DEVELOPMENTS AFFECT THE**
12 **COST OF EQUITY?**

13 **A.** The spread of COVID-19 caused the global economy to go into recession and affected
14 capital markets significantly. It increased uncertainty regarding corporate earnings and as
15 a result, stock prices became much more volatile in the U.S. and around the world. In the
16 first half of March 2020, stock prices crashed, but by mid-August 2020, the S&P 500 had
17 already fully recovered, consistently reaching new highs through the end of August 2021.
18 The unemployment rate increased to nearly 15% in April 2020 but came back down to
19 5.2% by August 2021.²¹ In the first and second quarters of 2020, real gross domestic
20 product fell sharply. In response, the Federal Reserve cut short-term Treasury yields to 0%

²⁰ *Bluefield Water Works & Improvement Company v. Public Service Commission of the State of West Virginia* 262 U.S. 679, 692-693 (1923).

²¹ <https://fred.stlouisfed.org/series/UNRATE>.

1 and began purchasing \$120 billion per month of long-term Treasury and corporate bonds.
2 Congress passed multiple stimulus packages worth trillions of dollars. The combination
3 of the pandemic's impact on the economy and the government's actions have led to
4 historically low interest rates and a lower cost of debt for corporations, including regulated
5 utility companies.

6 The pandemic's impact on the cost of equity is more complicated than its impact
7 on debt. During a financial crisis, many investors panic and sell shares in companies
8 without regard for their economics. Others are forced to sell because of margin calls. Many
9 unnerved investors purchase the safest (least risky) securities they can find, including
10 Treasury bonds and utility stocks, in a "flight-to-safety" response. All these activities can
11 impact the cost of equity across sectors, particularly in the short term.

12 **Q. PLEASE DISCUSS SOME RECENT MARKET DEVELOPMENTS THAT**
13 **IMPACT THE COST OF EQUITY.**

14 **A.** Below I will discuss in more depth the data presented in Table 6 on page 19. It is important
15 to consider the results of my cost of equity models (DCF and CAPM) in the context of
16 current financial market conditions as follows:

- 17 1. **Stock prices crashed and have more than recovered.** The S&P 500, Dow Jones
18 Industrial Average, and other stock indices fell faster in the second half of March
19 2020 than during the 2007-2008 financial crisis, the crash of 1987, and the Great
20 Depression. As of March 23, 2020, the S&P 500 had fallen approximately 34%
21 from its high reached on February 19, 2020. On August 18, 2020, the S&P 500 set
22 a new high, which represents the fastest recovery (126 trading days) from a bear
23 market. Water utility stocks initially fell slightly less than the overall market (about

1 26% off their peak versus 34% for the S&P 500) and lagged the market's recovery
2 in late 2020 and early 2021, but have considerably outperformed the market in the
3 last six months as of the end of August 31, 2021, going up 25.9% vs. 15.9% for the
4 S&P 500 Index.

5 2. **Low interest rates and a steep yield curve.** As short-term Treasury yields reached
6 0% shortly after the onset of the pandemic, long-term rates dropped sharply as well.
7 The difference between long-term and short-term yields, referred to as the yield
8 curve, increased. A steep yield curve (where long-term yields are significantly
9 higher than short-term yields) indicates that investors expect the economy to
10 improve.

11 3. **Credit spreads increased sharply, but have since declined below pre-pandemic**
12 **levels.** The spread between the yield investors demand to purchase U.S. corporate
13 bonds and U.S. Treasury bonds (see Chart 5 on page 28) increased significantly in
14 the initial phases of the COVID-19 pandemic, but never got as high as it did during
15 the financial crisis of 2007-2008. As of August 31, 2021, the yield spread for Baa
16 credit-rated corporate bonds is about 1.94%, below pre-pandemic levels of 1.98%
17 on December 31, 2019, after reaching a high of over 4.0% in March 2020.

18 4. **Investors' stock price volatility expectations have fallen from highs reached**
19 **during initial phases of the pandemic.** In March 2020, the VIX Index reached
20 levels not seen since the financial crisis of 2007-2008, and even set all-time records.
21 Volatility expectations remain higher than before COVID-19 but have declined
22 significantly since peaks reached in March 2020.

5. **Option-implied Market Risk Premiums have declined significantly since the peak reached during the pandemic but remain higher than before the pandemic.** As discussed in the CAPM section below, stock option data indicate that the premium investors require to invest in stock has likely increased because volatility expectations have increased since the spread of the coronavirus, but as reflected by the VIX Index, it has come down significantly since the period of peak volatility in March 2020.

6. RFC Water Proxy Group Forward 6-month Betas have decreased. As discussed in depth in the CAPM section below, stock option data indicate that investors expect water utility stock price movements to be less correlated to the overall market. All else equal, a lower beta indicates a lower cost of equity.

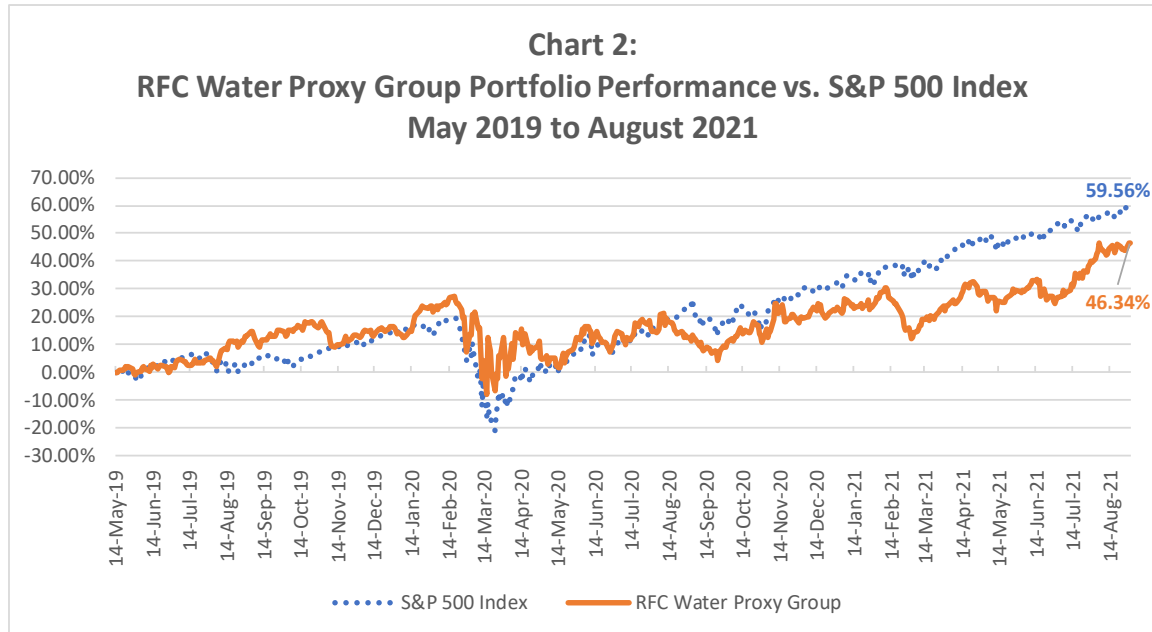
A. Stock Price Trends

Q. WHAT, IF ANYTHING, DOES STOCK MARKET DATA INDICATE WITH REGARD TO THE COST OF EQUITY?

A. As stock prices have shown an overall increase between 1926 and 2020, price-to-earnings (P/E) ratios have increased significantly as well.²² This indicates that the cost of equity may be decreasing along with the higher stock prices because investors are paying a higher price for the same earnings. For example, an investor paying \$100 for a share of a stock with \$10 per year of earnings will earn a 10% annual return, assuming no growth. If this stock goes up to \$200 per share, the annual earnings decrease to 5%. As shown in Chart 2 on page 24, until the recent COVID-19-related crash, stock prices for the S&P 500 and the

²² Duff & Phelps, 2021 SBBI Yearbook, Page 10-28.

RFC Water Proxy Group increased significantly in the nearly 2.3 years since PWR's last cost of capital order was issued on May 14, 2019.²³ After the significant losses due to COVID-19 in March 2020, the S&P 500 Index and the stock prices for the RFC Water Proxy Group have fully recovered and are up nearly 59.56% and 46.34% as of August 31, 2021, respectively.



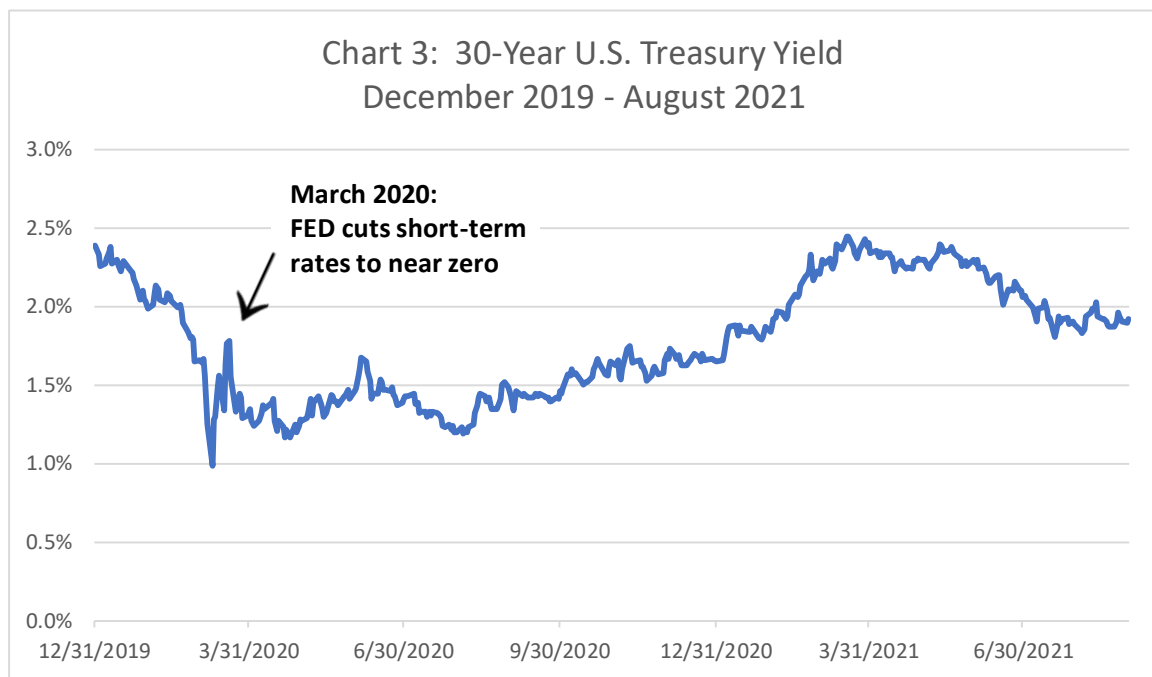
B. Interest Rates

Q. PLEASE DISCUSS THE CURRENT INTEREST RATE ENVIRONMENT AND WHAT IT INDICATES REGARDING THE COST OF EQUITY.

A. Two significant interest rate developments occurred in response to COVID-19. First, interest rates have fallen significantly since the beginning of COVID-19. Short-term interest rates are now near 0%. Starting in early March 2020, as shown on Chart 3 on page 25, yields on 30-year U.S. Treasuries have fallen from 2.39% as of December 31, 2019 to

²³ Docket No. 2018-82-S.

1 1.92% as of August 31, 2021. Federal Reserve officials signaled they expect to hold
 2 interest rates near zero until late 2023.²⁴ Despite statements by the Federal Reserve
 3 declaring that it might start reducing its bond purchasing program sooner than expected,
 4 long-term interest rates surprisingly declined. When the Federal Reserve began to ease its
 5 “easy-money” policies back in 2013, the resulting increase in interest rates was called a
 6 “Taper Tantrum.” This time around, the declining interest rates in response to the Federal
 7 Reserve’s potential policy changes are being called a “Taper Tranquility.”²⁵ Lower interest
 8 rates indicate a lower cost of equity for water utility companies because many bond
 9 investors sell bonds and purchase utility stocks as interest rates decline.



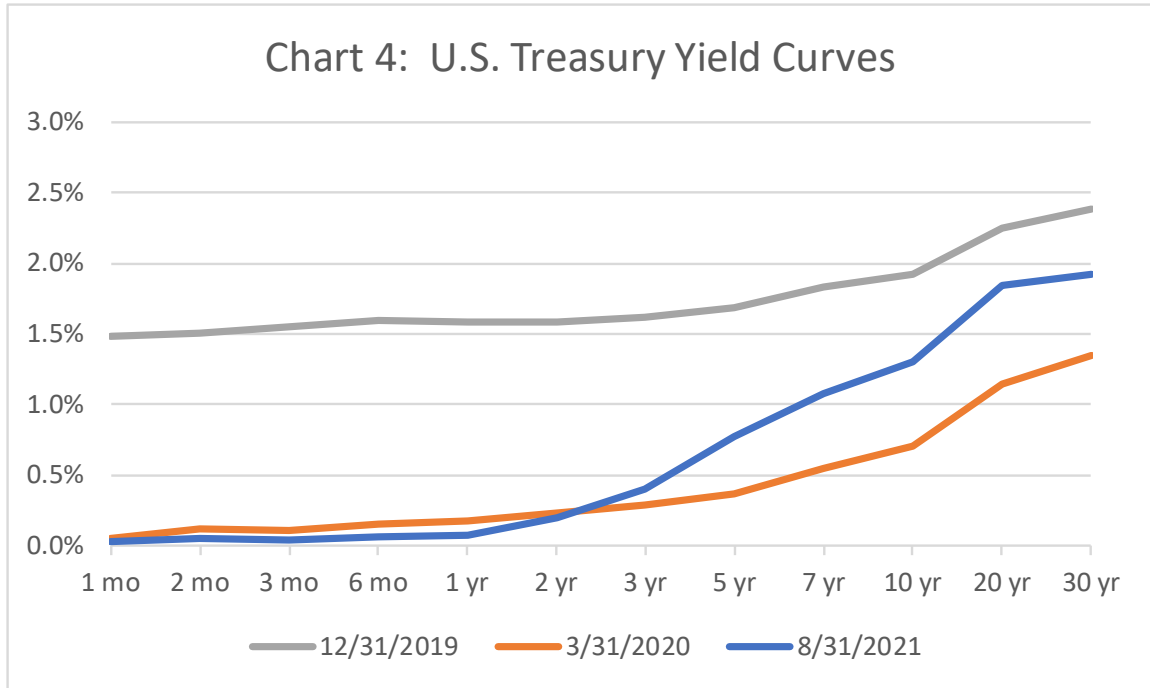
²⁴ Fed Pencils In Earlier Interest – Rate Increase, WSJ, June 16, 2021.

²⁵ Why There Is No ‘Taper Tantrum’ This Time Around, WSJ, June 22, 2021.

1 The second development, as shown in Chart 4 on page 27, is that the yield curve²⁶
2 has steepened significantly as a result of the Coronavirus-induced financial crisis.²⁷ Before
3 the crisis, on December 31, 2019, the yield on the 1-month Treasury bill was 1.48%,
4 increasing to 2.39% for the 30-year Treasury bond, which is less than double. On the other
5 hand, as of August 31, 2021, the yield curve has increased from 0.03% for the 1-month
6 Treasury bill to 1.92% for the 30-year U.S Treasury bond. A steep yield curve indicates
7 investors expect economic conditions to improve because, with expected profitable
8 investment opportunities, they require a significant premium in order to commit their
9 money for long periods of time. On the other hand, when the yield curve is “flat” they do
10 not require a premium to commit their money for long periods of time because they do not
11 expect as many opportunities.

²⁶ The difference between short-and long-term interest rates is the slope of the yield curve. As this difference increases, the yield curve becomes steeper.

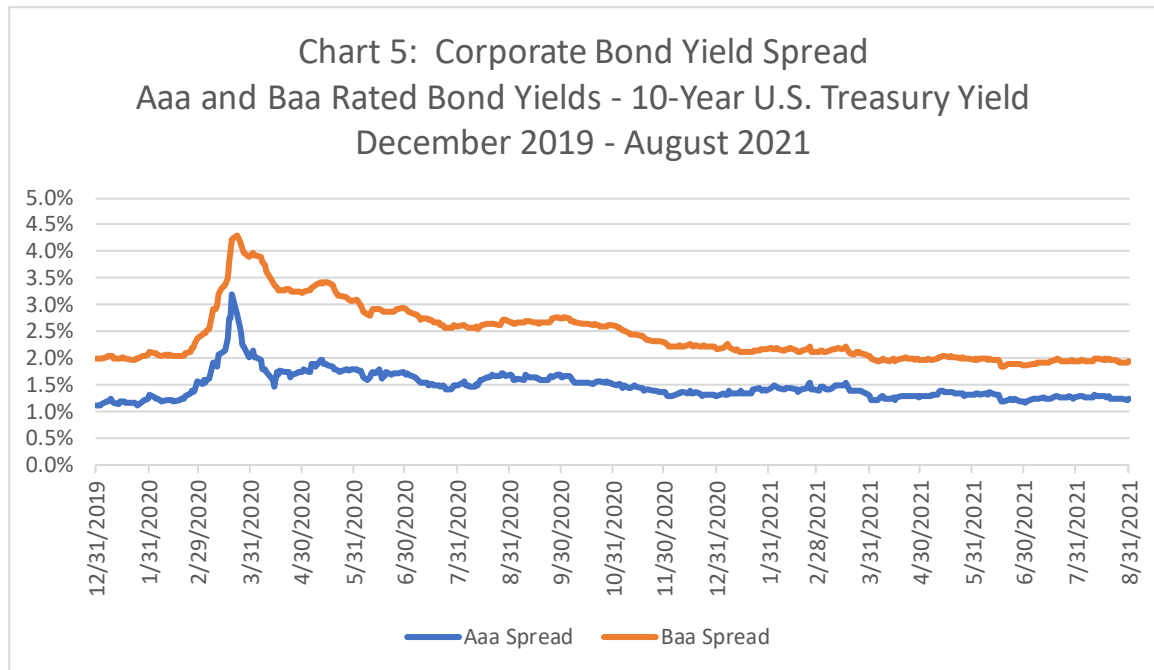
²⁷ The yield curve was even steeper for years (2009-2017) after the financial crisis of 2007-2008. It was relatively flat (short-term rates were about the same as long-term rates) for most of 2019 and early 2020 before the COVID-19 pandemic.



C. Increasing Credit Spreads

Q. WHAT DOES AN INCREASING CREDIT SPREAD MEAN FOR THE COST OF EQUITY?

A. As shown in Chart 5 on page 28, the yield spread between Corporate bonds and Treasury bonds increased significantly as the Coronavirus has spread throughout the world. The interest rate spread between Baa Corp bonds and 10-year U.S. Treasuries peaked at over 4% in mid-March 2020. This chart clearly shows that yield spreads have declined since their peak to pre-pandemic levels. As of August 31, 2021, the yield spread between Baa Corp bonds and 10-year U.S. Treasuries is 1.94%, more than 200 basis points lower than the peak reached in March 2020 and about the same level as before the pandemic. A declining yield spread indicates that investors' appetite for risk has increased since mid-March 2020. As investors' appetite for risk increases, the cost of equity tends to decline.



D. Volatility Expectations

Q. PLEASE DISCUSS CURRENT STOCK PRICE VOLATILITY EXPECTATIONS AND WHAT THEY INDICATE REGARDING THE COST OF EQUITY.

A. Volatility, uncertainty, and risk are synonymous. There are two primary types of volatility: “realized volatility” and “implied volatility.” The former is based on historical returns, which may or may not represent future volatility. On the other hand, implied volatility is calculated from options data, which indicates investors’ future expectations for volatility. As discussed below, the “term structure” of volatility indicates investors’ volatility expectations over different forward-looking time periods (e.g., 1-month, 1-year).

Q. PLEASE EXPLAIN THE “TERM STRUCTURE OF VOLATILITY.”

A. Investors can expect volatility to increase or decrease over time. Even during the height of a crisis, investors often expect volatility to decrease in coming months or years. In other

1 words, investors expect the current capital market hurricane to pass and the winds to die
2 down. In general (i.e., in “normal” financial markets), investors expect higher volatility
3 for longer time horizons. For example, investors generally expect the chance stock prices
4 will increase or decrease by 10% in 1 year (on an annual basis) to be greater than the chance
5 of a 10% move over the next 30 days (on an annual basis). This makes sense because there
6 is more uncertainty regarding economic and stock market changes the further in the future
7 you look out.

8 However, during the peak of implied volatility (to date) in mid-March 2020, shortly
9 after the World Health Organization declared COVID-19 a pandemic, the data indicated
10 that investors expected stock price volatility to decrease over time. This implies that
11 investors expected the riskiness of equity investments to decrease over time. As shown in
12 Chart 6 on page 30, before the COVID-19 outbreak, investors expected volatility to
13 increase from less than 15% annually at the 1-month time frame to about 20% annually at
14 the 24-month time frame. At the peak of the COVID-19 outbreak in March 2020, investors
15 expected volatility to decrease from over 70% at the 1-month time frame to about 38% at
16 the 24-month time frame.

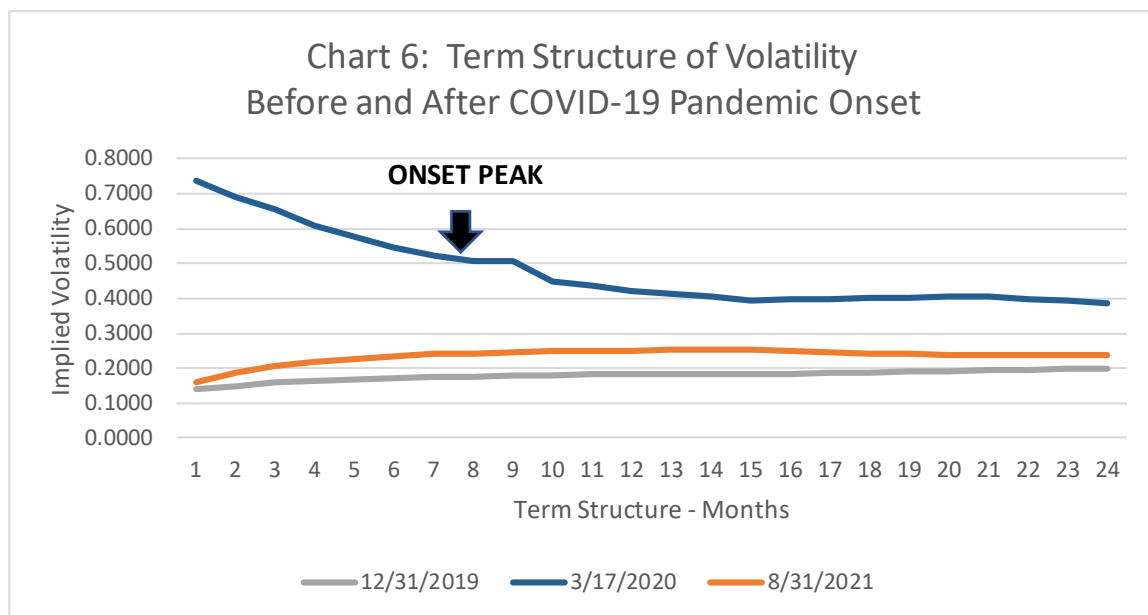
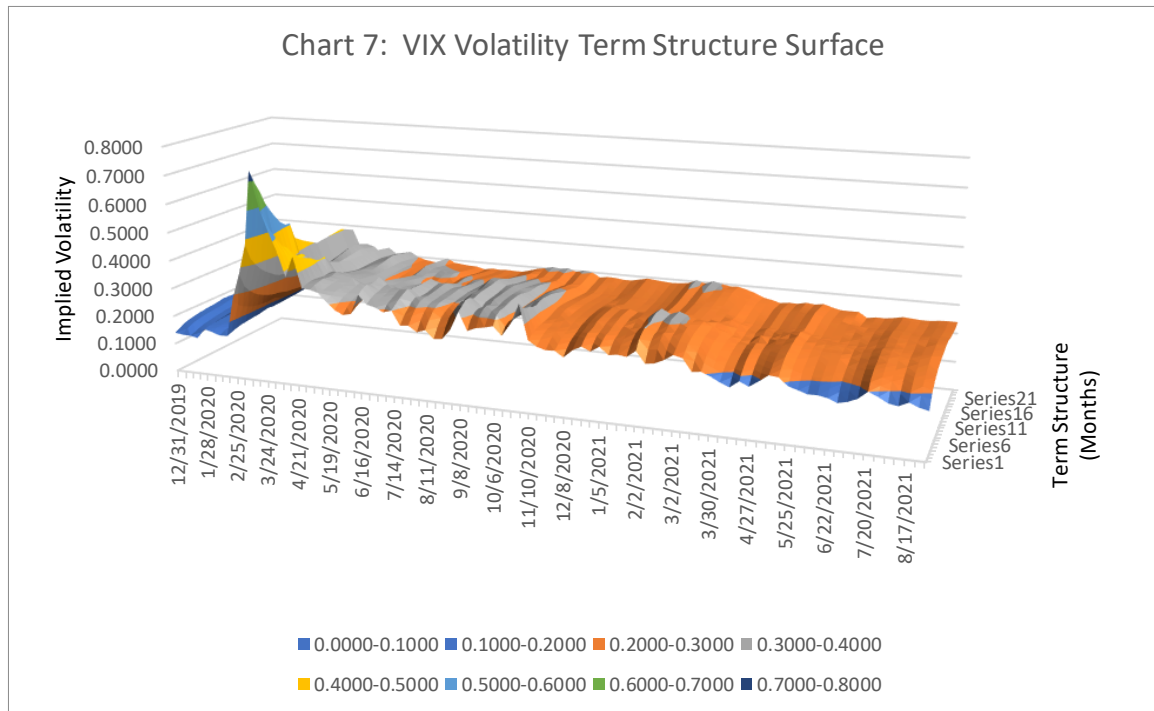


Chart 7 on page 31 provides a 3-dimensional surface²⁸ to show how the term-structure of volatility has evolved since before the COVID-19 outbreak and how it has changed during and since the outbreak. Chart 6 above is simply three selected cross sections of the same data in the surface in Chart 7. In the surface, one can see that on December 31, 2019, the term structure of volatility is almost flat, increasing slightly from 1-month to the 24-month time frame. In mid-March 2020, the implied volatility increased over every time period in comparison to January 7, 2020, but one can see that investors expected a declining term structure of volatility. By the end of July 2020, the implied volatility for all time periods had decreased, and the declining term structure moved to a more typical structure in which investors expected higher volatility over longer time periods, as it remains as of August 31, 2021.

²⁸ The X axis shows the implied volatility. The Y axis shows the data. The Z axis shows market expectation of future implied volatility of different time frames. Series1 = 1 month and Series24 = 24 months.



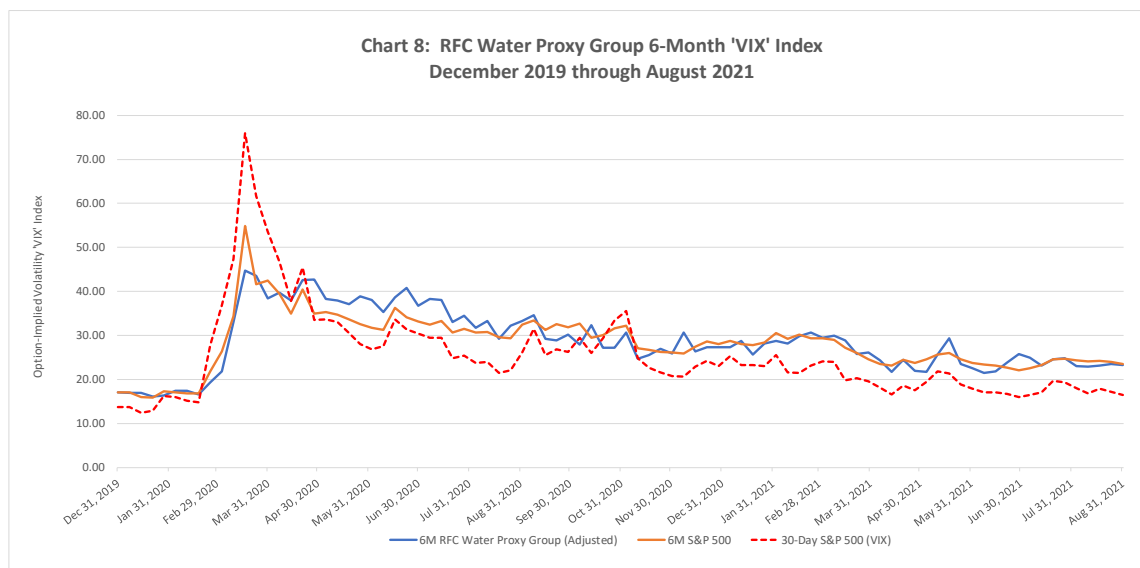
A declining term structure of volatility is important data to consider in determining the appropriate cost of equity for PWR because it shows that investors expected risk to decline during the peak of the pandemic's impact on financial markets. Lower risk means a lower cost of equity. Investors' market volatility expectations turned out to be correct. In March 2020, investors expected implied volatility to decline considerably over the next 12 to 24 months, and it has.

Q. HOW HAVE VOLATILITY EXPECTATIONS FOR WATER UTILITY COMPANIES COMPARED TO VOLATILITY EXPECTATIONS FOR THE S&P 500?

A. The dashed red line and the solid orange line in Chart 8 on page 32 show investors' stock price volatility expectations for the overall market (S&P 500) increased significantly as COVID-19 infections spread to the U.S. and continued to grow exponentially around the world. The dashed red line and solid orange line show volatility expectations over the next

30 days and 6 months, respectively. In December 31, 2019, investors expected an annualized change of 13.78% over the next 30 days. In mid-March 2020, investors' volatility expectations peaked at over 80% (on March 16, 2020, a point not actually shown on the chart). As of August 31, 2021, investors expect an annualized change of 16.48%.

The blue line in Chart 8 shows that investors' adjusted²⁹ 6-month volatility expectations for my RFC Water Proxy Group, as indicated by their stock option prices, increased along with the market in mid-March 2020, but to a significantly lesser degree. Investors' 6-month volatility expectations for water utility companies were higher than for the S&P 500 for the most part from May through August 2020, but have remained very comparable since then through August 31, 2021, at which point they were both roughly 23%.



²⁹ The implied volatility for individual stocks and small groups of stocks is almost always higher than the overall market because of the effects of diversification, even when the underlying stocks in the smaller portfolio are less risky, as is the case with water utility companies. As a result, Chart 8 adjusts the 6-month expected volatility for the RFC Water Proxy Group by the difference with the 6-month expected volatility for the S&P 500 Index on December 31, 2019 to facilitate the comparison throughout the chart.

1 As discussed below, changes in implied volatility do not paint the full cost of equity
2 picture. We must consider implied covariance, or how correlated investors expect the
3 volatility of returns for water utility companies and the overall market (e.g., S&P 500
4 Index) to be.

5 **Q. HOW IS COVID-19 IMPACTING FINANCIAL MARKETS AND THE COST OF**
6 **EQUITY FOR WATER UTILITY COMPANIES?**

7 **A.** The spread of COVID-19 caused a financial crisis. However, financial data indicate that
8 the capital market upheaval it generated was not long-lasting and did not significantly
9 impact the cost of equity for water utility companies. Investors know that water utility
10 companies provide an essential service that will be used and paid for even during a financial
11 crisis.

12 Although stock and bond prices remain more volatile than before COVID-19,
13 market data show that investors' volatility expectations have declined for both the overall
14 market and water utility companies since the onset of COVID-19 in mid-March 2020.
15 Investors' volatility expectations are important, but as explained in my CAPM section on
16 page 54, investors' expectations regarding the co-variance between water utility stocks and
17 the overall market are more relevant to cost of equity than volatility expectations alone.
18 Option-implied betas indicate that investors expect water utility stock price movements to
19 be less correlated with the overall market than before the pandemic. As explained below,
20 I use stock option data to calculate an "option-implied beta" which is a measurement to
21 determine what investors' expectations are regarding the covariance between the expected
22 returns for the RFC Water Proxy Group and for the S&P 500 Index. On December 31,
23 2019, the average option-implied beta for my RFC Water Proxy Group was 0.79. As of

1 August 31, 2021, the average option-implied beta of these 7 water utility companies is 0.69.
2 In other words, investors expect water utility stocks to move only 0.69% for every percent
3 the S&P 500 Index moves. Before the pandemic, investors expected that water utility
4 stocks would move about 0.79% for every 1.0% move of the S&P 500 Index. Declining
5 water utility option-implied betas indicate that investors understand that water utility
6 companies provide an essential service that will be relatively unimpacted by the overall
7 economy.

8 IV. CAPITAL STRUCTURE AND COST OF DEBT

9 **Q. MR. MOUL PROPOSES USING A CAPITAL STRUCTURE OF 59.92%**
10 **COMMON EQUITY AND 40.08% DEBT. DO YOU AGREE WITH HIS**
11 **RECOMMENDATION?**

12 **A.** I disagree with the use of this capital structure because the common equity ratio of PWR's
13 requested capital structure is significantly above the average of the 7 regulated water
14 utilities in my proxy group (49.3%). As a result, I recommend using a capital structure
15 consisting of 49.26% equity and 50.74% debt, based on the average common equity ratios
16 of the companies in my proxy group. As per Exhibit ALR-5, the common equity ratios of
17 the 7 companies in my proxy group are between 40.9% and 55.7%.

18 **Q. WHAT COST OF DEBT DO YOU RECOMMEND?**

19 **A.** Mr. Moul proposes using a cost of debt of 3.79% based on the average interest rate of Baa
20 rated public utility bonds for 2019 and 2020.³⁰ Interest rates on Baa rated corporate bonds

³⁰ Annual Baa Corp rates: 2019 = 4.19%, 2020 = 3.39%. Mr. Moul's 3.79% cost of debt recommendation = (4.19% + 3.39%) / 2. Mr. Moul's Direct Testimony, Schedule 11, page 1 of 3.

1 have declined in 2021. Therefore, I recommend that PWR's cost of debt be based on
2 interest rate data, including 2019, 2020 and up until August 2021. It is not fair to consumers
3 to ask them to pay for a cost of debt that is higher than the current market rate. Using the
4 most recent interest rate data in Mr. Moul's analysis would lead to an estimated cost of
5 debt of 3.20%.³¹ I therefore recommend setting PWR's rates based on a cost of debt 3.20%.

6 V. COST OF EQUITY CALCULATION

7 A. Overview

8 **Q. PLEASE PROVIDE AN OVERVIEW OF YOUR PERSPECTIVE REGARDING**
9 **HOW CAPITAL MARKETS RELATE TO THE COE AND THE OVERALL COST**
10 **OF CAPITAL**

11 **A.** The cost of capital is the return investors require to provide capital to PWR based on current
12 capital markets. The spread of COVID-19 has made it more challenging to determine the
13 current cost of capital because it has drastically increased the speed and intensity of capital
14 market change. To measure the cost of equity accurately during rapid change, it is critical
15 to use current market data. Because of the current financial crisis, it is particularly
16 important to consider model results in the context of extreme financial turbulence. To do
17 this, it is crucial to consider how capital markets and model results have changed over time
18 as this crisis has evolved since its onset in March 2020.

19 As discussed above, my COE recommendation is my opinion of the return investors
20 require to provide equity capital to PWR based on current capital markets. My

³¹ Exhibit ALR-6

1 recommendation is consistent with the following legal standards set by the United States
2 Supreme Court for a fair rate of return: “[t]he return to the equity owner should be
3 commensurate with returns on investments in other enterprises having corresponding
4 risks”³² and “sufficient to... support its credit and... raise the money necessary for the
5 proper discharge of its public duties.”³³

6 Because the cost of equity is not a published figure like a bond yield, some
7 interpretation is required to determine the appropriate market price. My cost of equity
8 recommendation is based on my computation of what the market indicates investors require
9 (return on investment) to provide capital to companies with comparable risk to PWR.

10 As explained below, I use current market prices (e.g., stocks, bonds, options), which
11 measure investors’ expectations directly, instead of relying solely on historical data and
12 analyst forecasts.

13 A COE based on market prices (market-based) is superior to a COE based on
14 historical data (non-market-based) for two reasons:

- 15 1. The COE that PWR has to pay investors is based on capital markets.
16 Interest rates remain at historical low levels after a persistent downtrend
17 since the early 1980s. It is possible interest rates will increase, but if the
18 marketplace expected interest rates to change, then that would already be
19 part of current prices.
- 20 2. Capital markets are unpredictable. Regarding capital markets’
21 unpredictability, investment guru Warren Buffet recently gave the

³² Federal Power Commission v. Hope Natural Gas Company 320 U.S. 591, 603 (1944).

³³ Bluefield Water Works & Improvement Company v. Public Service Commission of the State of West Virginia
262 U.S. 679, 692-693 (1923).

1 following advice to investors: “[t]hey should not listen to a lot of the
2 jabbering about what the market is going to do tomorrow, or next week or
3 next month because nobody knows.”³⁴

4 Current capital markets are our best source of investors’ expectations regarding
5 future capital markets. Current market prices of stocks and bonds reflect investors’
6 forecasts for long-term interest rates and capital markets in general. If, indeed, investors
7 in the aggregate should be expecting an increase in interest rates, adding a separate factor
8 for this on top of what is already indicated in market prices would amount to a double
9 count. As I will discuss below, PWR’s witness, Mr. Moul inflates his CAPM results by
10 using interest rate forecasts as a proxy for the risk free rate component of this model. There
11 is no reason to add this separate factor to current interest rates that already reflect investors’
12 expectations.

13 **Q. HOW DID YOU ARRIVE AT YOUR COE RECOMMENDATION?**

14 **A.** To arrive at my recommendation, I applied the DCF, including a Constant Growth and a
15 Non-Constant Growth method and a CAPM analysis to a group of similar companies
16 (“RFC Water Proxy Group”) using data available through August 31, 2021, as discussed
17 below. In all of my models, I use both historical averages and the most recently available
18 spot data for the inputs wherever it is possible and applicable.

³⁴ PBS News Hour, June 26, 2017, Part 1 – America should stand for more than just wealth, says Warren Buffett.

1 **Q. CONSIDERING THAT STOCK AND OPTION PRICES AND BOND YIELDS**
2 **CHANGE DAILY, WOULD IT NOT BE BETTER TO USE HISTORICAL**
3 **AVERAGES EXCLUSIVELY FOR THE INPUTS IN YOUR MODELS?**

4 **A.** Not necessarily. Most people would agree that the use of spot market data, the value of a
5 particular input on a particular day, can lead to COE results that can vary over short periods
6 of time. It may therefore be tempting to find a more stable value based on historical
7 averages that are not overly influenced by short-term fluctuations in capital markets. When
8 doing a forward-looking analysis, however, it is equally important to look at the most
9 recent market data as an indication of trends and where a given value is more likely to be
10 in the future. This is a broad and generally accepted principle, as made clear in the
11 following example.

12 As a simple example using historical stock prices to make the point clear, if
13 Company A's stock price were to go up linearly over the course of one year from \$50 to
14 \$100, its average stock price over that year would be \$75. If Company B's stock price
15 declined linearly from \$100 to \$50 over the same year, it would have the same exact
16 average stock price of \$75. But most people would agree that predicting both stock prices
17 at \$75 over the near future would be overly simplistic and leave readily accessible
18 forecasting data unused. Without relying on any additional data, at the very least, it would
19 stand to reason that in the near future, Company A's stock price is more likely to be
20 between \$75 and \$100 than Company B's stock price, and that Company B's stock price
21 is more likely to be between \$50 and \$75 than Company A's stock price. These
22 observations cannot be made by looking at the yearly averages alone and must take the
23 most recent data into consideration.

1 The point above does not eliminate concerns regarding the effect of daily
2 fluctuations in market data, especially during periods of volatility. As a result, it is
3 important to consider both averages and recent spot values when using market data for
4 forward-looking analyses. That is precisely my approach when using market data that are
5 expected to continue to fluctuate, such as stock prices, dividend yields, betas, and market
6 risk premia.

7 **Q. CAN A DIFFERENCE OF ONE DAY IN THE SELECTION OF SPOT DATA**
8 **HAVE A SIGNIFICANT POSITIVE OR NEGATIVE EFFECT ON ROE**
9 **RESULTS? IF SO, HOW DO YOU GO ABOUT CHOOSING WHICH DAY TO**
10 **USE FOR MARKET-BASED SPOT DATA?**

11 **A.** Daily fluctuations in stock prices, resulting dividend yields, betas, etc., all have an impact
12 on resulting ROE calculations, especially when using recent spot values for market data.
13 Such is the nature of market data, which change from day to day. This is rightfully noted
14 as a potential risk of using spot data, but given the stated benefits of using recent spot data
15 for forward-looking analyses, there are ways to address such potential pitfalls.

16 For this reason, it is very important to establish consistent methodologies that
17 eliminate the possibility of personal bias, especially when using spot market data. I
18 consistently use the last trading day of the last full calendar month before my schedule
19 preparations for all market-based spot data and as the last day for all historical market-data
20 averages.

21 It is important to keep in mind that even averages fluctuate over time, and all
22 responsible data analysts must find a consistent and reproducible way to “freeze time” to
23 work with such fluctuations while eliminating bias.

It is also important to point out once again that I use recent spot market-data to establish one benchmark for market-based inputs, which are balanced by the use of historical averages, as stated previously.

B. Proxy Group Selection

Q. PLEASE EXPLAIN HOW YOU SELECTED THE COMPANIES IN YOUR COMPARABLE PROXY GROUP?

A. My comparable proxy group, referred to as the RFC Water Proxy Group, consists of the 7 publicly traded water utility companies covered by Value Line. I did not include Artesian Resources Corp in my proxy group because Value Line does not provide the necessary information (e.g. future expected return on book equity) for this company. Other than Artesian, my water proxy group is the same as Mr. Moul's and includes the following companies:

TABLE 7: RFC WATER PROXY GROUP COMPOSITION		
	Company Name	Ticker
1	American States Water Company	AWR
2	American Water Works Company	AWK
3	Essential Utilities, Inc.	WTRG
4	California Water Service Group	CWT
5	Middlesex Water Company	MSEX
6	The York Water Company	YORW
7	SJW Group	SJW

C. Discounted Cash Flow

Q. PLEASE SUMMARIZE THE RESULTS OF YOUR DCF MODELS.

A. I used both the constant growth form of the DCF method, which determines growth based on the sustainable retention growth procedure, and a non-constant growth DCF method. My constant growth form DCF analysis indicates a COE range of between 8.05% and 8.15% for the RFC Water Proxy Group.³⁵ The results of my non-constant growth DCF method indicate a COE of between 5.80% and 6.03% for the RFC Water Proxy Group.³⁶

Q. WHAT IS THE DISCOUNTED CASH FLOW METHOD?

A. The DCF method, is an approach to determining the COE. The method recognizes that investors purchase common stock to receive future cash payments. These payments come from: (a) current and future dividends, and (b) proceeds from selling stock. A rational investor will buy stock to receive dividends and to ultimately sell the stock to another investor at a gain. The price the new owner is willing to pay for stock is related to that buyer's expectation of future flow of dividends and the future expected selling price. The value of the stock is the discounted value of all future dividends until the stock is sold plus the value of proceeds from the sale of the stock.

Q. HAVE INVESTORS ALWAYS USED THE DCF METHOD?

A. While investors who buy stock have always done so for future cash flow, the DCF approach first appeared in the 1937 Harvard Ph.D. thesis of John Burr Williams titled *The Theory of Investment Value*. Author Peter L. Bernstein once stated that "Williams' model for valuing

³⁵ See Exhibit ALR-3, page 1.

³⁶ See Exhibit ALR-3, page 2 and Exhibit ALR-3, page 3.

1 a security calls for the investor to make a long-run projection of a company's future
2 dividend payments..."³⁷ The Williams DCF model separately discounts each and every
3 future expected cash flow. Dividends and proceeds from the sale of stock are the expected
4 cash flows. Its accuracy is therefore unaffected by non-constant growth rates. Myron
5 Gordon and Eli Shapiro, who helped to make this method widely used, referred to
6 Williams' work in their paper published in 1956 "*Equipment Analysis: The Required Rate*
7 *of Profit.*"

8 **D. Constant Growth Form of the DCF Model**

9 **Q. YOU STATE YOU USED THE CONSTANT GROWTH FORM OF THE DCF**
10 **MODEL. WHAT IS THE CONSTANT GROWTH FORM OF THE DCF MODEL?**

11 **A.** The constant growth form of the DCF model is a form of the DCF method that can be used
12 in determining the COE when investors can reasonably expect that the growth of retained
13 earnings and dividends will be constant.

14 Retained earnings are funds that a company keeps in its treasury, so that they are
15 available for future needs, such as operating expenses, capital expenditures, debt payments,
16 and new investments. These retained earnings show investors whether the company is
17 growing, which, in turn, is a measure of the future indicator of dividends and the value of
18 a company's stock.

19 **Q. DESCRIBE HOW THE CONSTANT GROWTH MODEL WORKS.**

20 **A.** The constant growth model is described by this equation $k = D/P + g$, where:³⁸

³⁷ P. BERNSTEIN, *Capital Ideas: The Improbable Origins of Modern Wall Street* (The Free Press, © 1992).

³⁸ M. GORDON, *Cost of Capital to a Public Utility*, at 32-33 (MSU Public Utility Studies 1974).

1 k= cost of equity (COE);
 2 D=Dividend; and
 3 P=Market price of stock at time of the analysis

4 and where:

5 g=the growth rate, where $g = br + sv$;
 6 b=the earnings retention rate;
 7 r=return on common equity investment (referred to below as “book equity”);
 8 v=the fraction of funds raised by the sale of stock that increases the book value of
 9 the existing shareholders’ common equity; and
 10 s=the rate of continuous new stock financing

11
 12 The constant growth model is therefore correctly recognized to be:

13
 14
$$k = D/P + (br + sv)$$

15 The COE demanded by investors is the sum of two factors. The first factor is the
 16 dividend yield. The second factor is growth (dividends and stock price). The logical
 17 relationship among these factors is as follows: the dividend yield is calculated based on
 18 current dividend payments while growth indicates what dividends and stock price will be
 19 in the future.

20 **Q. WHAT OTHER FACTORS IMPACT HOW ONE USES THE CONSTANT**
 21 **GROWTH FORM OF THE DCF MODEL?**

22 **A.** Sufficient care must be taken to be sure that the growth rate “g” is representative of the
 23 constant sustainable growth. To obtain an accurate constant growth DCF result, the
 24 mathematical relationship between earnings, dividends, book value and stock price must
 25 be respected.

26 The basic difference between the use of an analysts’ earnings per share growth rate
 27 in the constant growth DCF formula and using the “br” (b (the earnings retention rate) X r
 28 (rate of return on common equity investment)) approach is that the “br” form, if properly
 29 applied, eliminates the mathematical error caused by an inconsistency between the

1 expectations for earnings per share growth and dividends per share growth. Because it
2 eliminates that error, the results of a properly applied “br” approach will be superior to the
3 answer obtained from other approaches to the constant growth form of the DCF model.
4 This is not to say that even a properly applied “br” approach will be perfect. The self-
5 correcting nature of a properly applied “br” to forecasted differences in earnings per share
6 and dividends per share growth rates help mitigate the resultant error but should not be
7 viewed as the perfect way to quantify the impact of expected non-constant growth rates.

8 **Q. ARE YOU AWARE OF CLAIMS ALLEGING THAT THE “BR” APPROACH TO**
9 **THE CONSTANT GROWTH DCF MODEL IS FLAWED BECAUSE IT RELIES**
10 **ON THE VALUE OF THE FUTURE EXPECTED RETURN ON BOOK EQUITY**
11 **“R” TO ESTIMATE WHAT THE EARNED RETURN ON EQUITY SHOULD BE?**

12 **A.** Yes. One common criticism is that it is not reasonable for the DCF to indicate a COE
13 (market return) that is different (lower or higher) than the expected return on book equity
14 (accounting). There are multiple reasons why this concern is unfounded:

15 1. The constant growth form of the equation using “br” is:

$$k = D/P + (br + sv)$$

17 In this equation, “k” is the variable for the COE, and “r” is the future
18 expected return on equity. The COE, “k,” is not the same variable as the
19 future expected earned return on equity, “r.” In fact, there often is a large
20 difference between the two.

21 2. The correct value to use for “r” is the return on book equity expected by
22 investors as of the time the stock price and dividend data are used to
23 quantify the D/P term in the equation. Therefore, even if future events occur

1 that may change what investors expect for “r,” the computation of the COE
2 “k” remains correct as of the time the computation was made.

- 3 3. The ability of a commission’s ROE decision to influence future cash flow
4 expectations is not unique to the retention growth DCF approach. The five-
5 year analysts’ earnings per share growth rate is a computation that is directly
6 influenced by what earnings per share will be in 5 years. Allowed ROEs
7 impact earning – higher allowed returns lead to higher earnings growth
8 because the higher allowed returns the more earnings are available for
9 reinvestment.

10 **Q. CAN CHANGES IN THE ACTUAL EARNED RETURNS IMPACT GROWTH**
11 **ABOVE AND BEYOND WHATEVER GROWTH RESULTS FROM EARNINGS**
12 **RETENTION?**

13 **A.** Yes, but large short-term changes in earnings per share caused by a perceived change in
14 the future expected earned returns are unsustainable. The new perceived earned return on
15 book equity should be part of the computation, but the one-time growth spurt to get there
16 is no more indicative of the sustainable growth required in the constant growth DCF
17 formula than the temporary negative growth that occurs when a company has a bad year.

18 **Q. HOW HAVE YOU IMPLEMENTED THE CONSTANT GROWTH FORM OF THE**
19 **DCF MODEL IN THIS CASE?**

20 **A.** I have applied the constant growth form of the DCF model by staying true to the
21 mathematically derived “ $k=D/P + (br + sv)$ ” form of the DCF model. I have also taken
22 care to fully allocate all future expected earnings to either future cash flow in the form of
23 dividends (“D”) or to retained earnings (the retention rate, “b”). This extra accuracy is

1 obtained only when the retention rate “b” is derived from the values used for “D” and “r,”
2 rather than independently.

3 **Q. PLEASE EXPLAIN HOW YOU OBTAINED THE VALUES YOU USED IN THE**
4 **CONSTANT GROWTH FORM OF THE DCF METHOD.**

5 **A.** The DCF model generally calls for the use of the dividend expected over the next year. A
6 reasonable way to estimate next year’s dividend rate is to increase the quarterly dividend
7 rate by half of the current actual quarterly dividend rate. This is a good approximation of
8 the rate that would be obtained if the full prior year’s dividend were escalated by the entire
9 growth rate.³⁹

10 I obtained the stock price—“P”—used in my DCF analysis from the closing prices
11 of the stocks on August 31, 2021. I also obtained an average stock price for the 12 months
12 ending August 31, 2021 by averaging the high and low stock prices for the year.

13 I based the value of the future expected return on equity— “r” —on the average
14 return on book equity expected by Value Line, adjusted in consideration of recent returns.
15 I also made a computation that was based on a review of both the earned return on equity
16 consistent with analysts’ consensus earnings growth rate expectations and on the actual
17 earned returns on equity. For a stable industry such as utility companies, investors will

³⁹ For example, assume a company paid a dividend of \$0.50 in the first quarter a year ago, and has a dividend growth rate of 4 % per year. This dividend growth rate equals $(1.04)^4 - 1 = 0.00985$ % per quarter. Thus, the dividend is \$0.5049 in the second quarter, \$0.5099 in the third quarter, and \$0.5149 in the fourth quarter. If that 4 % per annum growth continues into the following year, then the dividend would be \$0.5199 in the 1st quarter, \$0.5251 in the 2nd quarter, \$0.5303 in the 3rd quarter, and \$0.5355 in the 4th quarter. Thus, the total dividends for the following year equal \$2.111 ($0.5199 + 0.5251 + 0.5303 + 0.5355$). I computed the dividend yield by taking the current quarter (the \$0.5149 in the 4th quarter in this example) and multiplying it by 4 to get an annual rate of \$2.06. I then escalated this \$2.06 by half the 4 % growth rate, which means it is increased by 2 %. $\$2.06 \times 1.02 = \2.101 , which is within one cent of the \$2.111 obtained in the example.

1 typically look at actual earned returns on equity as one meaningful input into what can be
2 expected for future earned returns on book equity. See Exhibit ALR-3, page 1.

3 This return on book equity expectation used in the DCF method to compute growth
4 must *not* be confused with the COE. Since the stock prices for the comparative companies
5 are substantially higher than their book value, the return investors expect to receive on their
6 market price investment is considerably less than the anticipated return on book value. If
7 the market price is low relative to book value, the COE will be higher than the future
8 expected return on book equity, and if the market price is high, then the return on book
9 equity will be less than the COE.

10 In addition to growing through the retention of earnings, utility companies also
11 grow by selling new common stock. Selling new common stock increases a company's
12 growth. I quantified this growth caused by the sale of new common stock by multiplying
13 the amount that the actual market-to-book ratio exceeds 1.0, by the compound annual
14 growth rate of stock that Value Line forecasts. The results of that computation are shown
15 on line 4 of Exhibit ALR-3, page 1.

16 Pure financial theory prefers concentrating on the results from the most current
17 price because investors cannot purchase stock at historical prices. There is a legitimate
18 concern, however, about the potential distortion of using just a single price. I present DCF
19 results based on the most recent stock pricing data (August 31, 2021) as well as the average
20 of the high and low stock price over the past 12 months to obtain a range of reasonable
21 values. As shown in Exhibit ALR-3, page 1, the DCF result based on the average of the
22 high and low stock price for the year ending August 31, 2021 is 8.05%. The DCF result
23 based on the stock price as of August 31, 2021 is 8.15%. Exhibit ALR-3, page 1, shows

1 more of the specifics of how I implemented the constant growth form of the DCF model
2 for the RFC Water Proxy Group.

3 **Q. PLEASE EXPLAIN HOW YOU DETERMINED WHAT VALUE TO USE FOR**
4 **“R” WHEN COMPUTING GROWTH IN YOUR CONSTANT GROWTH FORM**
5 **OF THE DCF MODEL.**

6 **A.** The inputs I considered are shown in Footnote [C] of Exhibit ALR-3, page 1. The value of
7 “r” that is appropriate to use in the DCF formula is the value anticipated by investors to be
8 maintained on average in the future. This Exhibit shows that the average future return on
9 equity forecasted by Value Line for the RFC Water Proxy Group between 2021 and 2024-
10 26 is 11.29%. The same footnote also shows that the future expected return on equity
11 derived from the Zacks consensus forecast is 8.23%, and that the actual returns on equity
12 earned by the RFC Water Proxy Group on average were 9.89% in 2018, 9.49% in 2019,
13 and 10.39% in 2020. Based on the combination of the forecasted return on equity derived
14 from the Zacks consensus, the recent historical actual earned returns, and Value Line’s
15 forecast, I made the DCF growth computation using a 10.80%⁴⁰ value of “r”.

16 **Q. WHAT COE IS INDICATED BY THE CONSTANT GROWTH FORM OF THE**
17 **DCF METHOD THAT YOU RELY ON FOR YOUR RECOMMENDATION?**

18 **A.** The result of my DCF analysis using the Constant Growth form of the DCF indicates a
19 COE range of between 8.05% and 8.15% for the RFC Water Proxy Group.⁴¹ Since these
20 DCF findings use analysts’ forecasts to derive sustainable growth (in part) and on analysts’

⁴⁰ I used 10.80% in consideration of historical returns, allowed returns, and Value Line projected returns for the RFC Water Proxy Group.

⁴¹ Exhibit ALR-3, page 1.

1 forecasts of dividend growth and book value growth in the non-constant form of the DCF
2 method, the results should be considered as conservatively high. This is because, as
3 previously mentioned above, analysts' forecasts of such growth have been notoriously
4 overstated.

5 My results are not as influenced by overly-optimistic analysts' forecasts as would
6 have been the case had I merely used analysts' five-year earnings growth rate forecasts as
7 a proxy for long-term growth. This is because the DCF methods I use compute sustainable
8 growth rates, rather than growth rates that can exaggerate the growth rate due to assuming
9 that a relatively short-term forecast (5 years) will remain indefinitely.

10 **E. Non-Constant Growth Form of the DCF Model**

11 **Q. PLEASE EXPLAIN HOW YOU IMPLEMENTED THE NON-CONSTANT**
12 **GROWTH FORM OF THE DCF MODEL.**

13 **A.** The non-constant growth form of the DCF model determines the return on investment
14 expected by investors based on an estimate of each separate annual cash flow the investor
15 expects to receive. For the purpose of this computation, I have incorporated Value Line's
16 detailed annual forecasts to arrive at the specific non-constant growth expectations that an
17 investor who trusts Value Line would expect. This implementation is shown on Exhibit
18 ALR-3, page 2 and Exhibit ALR-3, page 3. In the first stage, cash flow entry is the cash
19 outflow an investor would experience when buying a share of stock at the market price.
20 The subsequent years of cash flow are equal to the dividends per share that Value Line
21 forecasts. For the intermediate years of the forecast period in which Value Line does not
22 provide a specific dividend, the annual dividends were obtained by estimating that dividend

1 growth would persist at a compound annual rate. The cash flow at the end of the forecast
2 period consists of both the last year's dividend forecast by Value Line, and the proceeds
3 from the sale of the stock. The stock price used to determine the proceeds from selling the
4 stock was obtained by estimating that the stock price would grow at the same rate at which
5 Value Line forecasts book value to grow.

6 **Q. WHY DID YOU USE BOOK VALUE GROWTH TO PROVIDE THE ESTIMATE**
7 **OF THE FUTURE STOCK PRICE?**

8 **A.** For any given earned return on book equity, earnings are directly proportional to the book
9 value. Furthermore, book value growth is the net result after the company produces
10 earnings, pays a dividend and also, perhaps, either sells new common stock at market price
11 or repurchases its own common stock at market price.

12 Once these cash flows are entered into an Excel spreadsheet, the compound annual
13 return an investor would achieve as a result of making this investment was obtained by
14 using the Internal Rate of Return (IRR) function built into the spreadsheet. As shown on
15 Exhibit ALR-3, page 2 and Exhibit ALR-3, page 3, this multi-stage DCF model produced
16 an average indicated COE of 5.80% based on the year-end stock price, and 6.03% based
17 on average prices for the year ending August 31, 2021 for the RFC Water Proxy Group.

18 **Q. YOUR NON-CONSTANT GROWTH DCF MODEL USES ANNUAL EXPECTED**
19 **CASH FLOWS. SINCE DIVIDENDS ARE PAID QUARTERLY RATHER THAN**
20 **ANNUALLY, HOW DOES THIS SIMPLIFICATION IMPACT YOUR RESULTS?**

21 **A.** I used the annual model because it is easier to input the data and for observers to visualize
22 what is happening. By modeling cash flows to be annual rather than when they are actually
23 expected to occur causes a small overstatement of the COE.

1 **Q. WHY IS IT A SMALL OVERSTATEMENT OF THE COE IF YOU HAVE**
2 **MODELED DIVIDENDS TO BE RECEIVED SOME MONTHS AFTER**
3 **INVESTORS ACTUALLY EXPECT TO RECEIVE THEM?**

4 **A.** The process of changing from an annual model to a quarterly model would require two
5 changes, not just one. A quarterly model would show dividends being paid sooner and
6 would also show earnings being available sooner. A company that receives its earnings
7 sooner, rather than at the end of the year, has the opportunity to compound them. Since
8 revenues, and therefore earnings, are essentially received every day, a company that is
9 supposed to earn an annual rate of 9.00% on equity would have to earn only 8.62% if the
10 return were compounded daily.⁴² This reduction from 9.00% to 8.62% would then be
11 partially offset by the impact of the quarterly dividend payment to bring the result of
12 switching from the simplifying annual model closer to, but still a bit below 9.00%.

13 **Q. BY USING CASH FLOW EXPECTATIONS AS THE VALUATION PARAMETER,**
14 **DOES THE NON-CONSTANT DCF MODEL STILL RELY ON EARNINGS?**

15 **A.** Yes. It relies on an expectation of future cash flows. Future cash flows come from
16 dividends during the time the stock is owned and capital gains from the sale of the stock
17 once it is sold. Since earnings impact both dividends and stock price, the non-constant
18 DCF model still relies on earnings.

19 Every dollar of earnings is used for the benefit of stockholders, either in the form
20 of a dividend payment, or earnings reinvested for future growth in earnings and/or
21 dividends. Earnings paid out as a dividend have a different value to investors than earnings
22 retained in the business. Recognizing this difference and properly considering it in the

⁴² $(1 + .0862/365)^{365} = 1.09 = 9.00\%$.

1 quantification process is a major strength of the DCF model and is why the non-constant
2 DCF model as I have set forth is an improvement over either the price-to-earnings ratio
3 (P/E ratio) or dividend/price (D/P) methods. Comparing the P/E ratios and the dividend
4 yield (D/P) are helpful as a rule of thumb, but they must be used with caution because,
5 among other reasons, two companies with the same dividend yield can have a different
6 COE if they have different retention rates. A DCF model is more reliable than these rules
7 of thumb because it can account for different retention rates, among other factors.

8 **Q. WHY IS THERE A DIFFERENCE TO INVESTORS IN THE VALUE OF**
9 **EARNINGS PAID OUT AS A DIVIDEND COMPARED TO THE VALUE OF**
10 **EARNINGS RETAINED IN THE BUSINESS?**

11 **A.** The return on earnings retained in the business depends upon the opportunities available to
12 that company. If a regulated utility reinvests earnings in needed “used and useful” utility
13 assets, then those reinvested earnings have the potential to earn at whatever return is
14 consistent with ratemaking procedures allowed and the skill of management in prudently
15 operating the system.

16 When an investor receives a dividend, he can either reinvest it in the same or
17 another company or use it for other things, such as paying down debt or paying living
18 expenses. Although an investor could theoretically use the proceeds from any dividend
19 payments to simply buy more stock in the same company, when an investor increases her
20 investment in a company by purchasing more stock, the transaction occurs at market price.
21 However, when the same investor sees her investment in a company increase because
22 earnings are retained rather than paid as a dividend, the reinvestment occurs at book value.
23 Stated within the context of the DCF terminology: earnings retained in the business earn at

1 the future expected return on book equity “r,” and dividends used to purchase new stock
2 earn at the rate “k.” When the market price exceeds book value (that is, the market-to-
3 book ratio exceeds 1.0), retained earnings are worth more than earnings paid out as a
4 dividend because “r” will be higher than “k.” Conversely, when the market price is below
5 book value, “k” will be higher than “r,” meaning that earnings paid out as a dividend earn
6 a higher rate than retained earnings.

7 **Q. IF RETAINED EARNINGS WERE MORE VALUABLE WHEN THE MARKET-**
8 **TO-BOOK RATIO IS ABOVE 1.0, WHY WOULD A COMPANY WITH A**
9 **MARKET-TO-BOOK RATIO ABOVE 1.0 PAY A DIVIDEND RATHER THAN**
10 **RETAIN ALL OF THE EARNINGS?**

11 **A.** Retained earnings are more valuable than dividends only if there are sufficient
12 opportunities to profitably reinvest those earnings. Regulated utility companies are
13 allowed to earn the cost of capital only on assets that are used and useful in providing utility
14 service. Investing in assets that are not needed may not produce any return at all. For
15 unregulated companies, opportunities to reinvest funds are limited by the demands of the
16 business. For example, how many new computer chips can Intel profitably develop at the
17 same time?

18 **Q. UNDER THE NON-CONSTANT DCF MODEL, IS IT NECESSARY FOR**
19 **EARNINGS AND DIVIDENDS TO GROW AT A CONSTANT RATE FOR THE**
20 **MODEL TO BE ABLE TO ACCURATELY DETERMINE THE COST OF**
21 **EQUITY?**

22 **A.** No. Because the non-constant form of the DCF model separately discounts each and every
23 future expected cash flow, it does *not* rely on any assumptions of constant growth. The

dividend yield can be different from period to period, and growth can bounce around in any imaginable pattern without harming the accuracy of the answer obtained from quantifying those expectations. When the non-constant DCF model is correctly used, the answer obtained is as accurate as the estimates of future cash flow.

Q. WHAT COST OF EQUITY DOES YOUR NON-CONSTANT GROWTH DCF METHOD INDICATE?

A. My non-constant growth DCF method indicates a cost of equity of between 5.80% and 6.03%.⁴³

F. Capital Asset Pricing Model

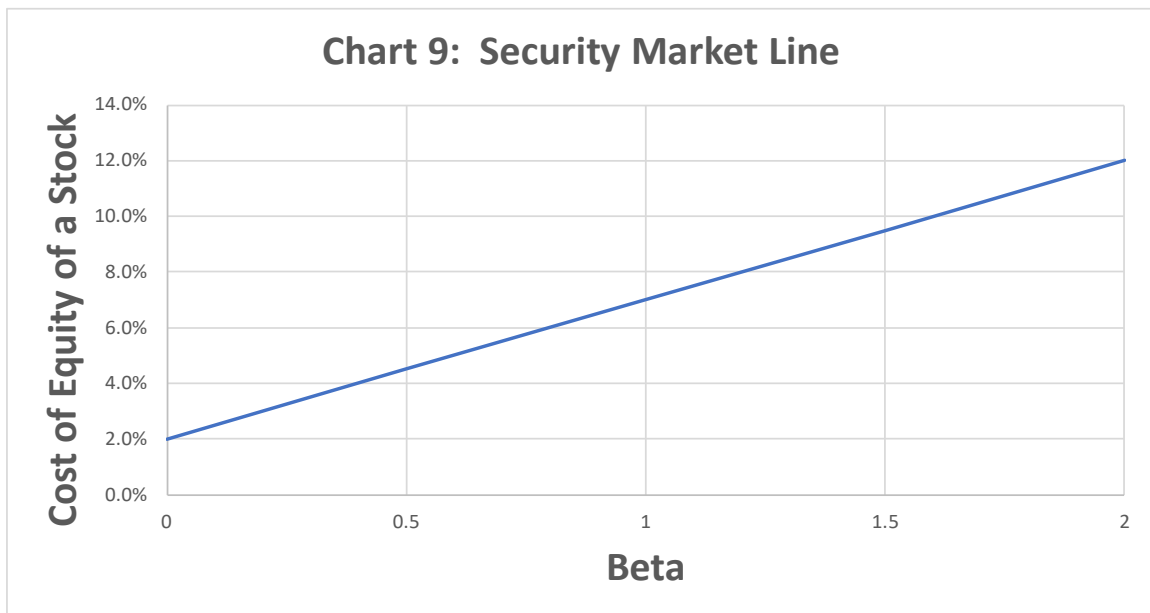
Q. PLEASE DESCRIBE THE CAPM.

A. CAPM stands for “Capital Asset Pricing Model.” The CAPM relates return to risk; specifically, it relates the expected return on an investment in a security to the risk of investing in that security. The riskier the investment, the greater the expected return (i.e., the cost of equity) investors require to make that investment.

Investors in a firm’s equity face two types of risks: (1) firm-specific risk and (2) market risk (financial analysts refer to this market risk as systematic risk). Firm-specific risk refers to risks unique to the firm, such as management performance and losing market share to a new competitor. Investors can reduce firm-specific risk by purchasing stocks as part of a diverse portfolio of companies if they construct the portfolio to cause the firm-specific risk of individual companies to balance out. Market-related risk refers to potential

⁴³ Exhibit ALR-3, page 2 and Exhibit ALR-3, page 3.

1 impacts from the overall market, such as a recession or interest rate changes. This risk
 2 cannot be removed by diversification, so the investor must bear it no matter what. Because
 3 the investor has no option but to bear market risk, the investor's cost of equity will reflect
 4 that risk. The CAPM predicts that for a given equity security, the cost of equity has a
 5 positive linear relationship to how sensitive the stock's returns are to movements in the
 6 overall market (e.g., S&P 500). A security's market sensitivity is measured by its beta.⁴⁴
 7 As shown in Chart 9 below, the higher the beta of a stock, the higher the company's cost
 8 of equity—the return required by the investor to invest in the stock.



9 Here is the standard CAPM formula:

$$K = R_f + \beta_i * (R_m - R_f)$$

10 Where:

11 K is the cost of equity;

12 R_f is the risk-free interest rate;

13 R_m is the expected return on the overall market (e.g., S&P 500);

⁴⁴ The covariation of the return on an individual security with the return on the market portfolio.

[$R_m - R_f$] is the premium investors expect to earn above the risk-free rate for investing in the overall market (“equity risk premium” or “market risk premium”); and β_i (Beta) is a measure of non-diversifiable, or systematic, risk.

Q. PLEASE EXPLAIN HOW YOU IMPLEMENTED THE CAPM.

A. First, I determined appropriate values or ranges for each of the three model inputs: (a) Risk-Free Rate, (b) Beta, and (c) Equity Risk Premium. Second, I used the equation above to calculate the cost of equity implied by the model. Below I will explain how I calculated the three model inputs and summarize the CAPM cost of equity numbers resulting from those inputs. Table 8 and Table 9 on page 84 show the results of my CAPM.

Risk-Free Rate

Q. WHAT RISK-FREE RATE DID YOU USE IN YOUR CAPM?

A. It is generally preferable to use the market yield on short-term U.S. Treasury yields as the risk-free rate because these bonds have a beta close to zero. *Principles of Corporate Finance* states “The CAPM... calls for a short-term interest rate.”⁴⁵ I chose to use a risk-free rate based on both long- and short-term Treasury yields, however, because, as indicated by the steepness of the yield curve,⁴⁶ investors with a longer investment horizon would likely use a higher risk-free rate as an opportunity cost for their investment decisions. My short-term risk-free rate is based on the yield of 3-month U.S. Treasury bills and my long-term risk-free rate is based on the yield of 30-year U.S. Treasury bonds. In line with my Spot and Weighted Average CAPM approaches, I use both spot values as

⁴⁵ Brealey, Myers, and Allen (2017), *Principles of Corporate Finance*, 12th Edition, McGraw-Hill Irwin, New York, page 228.

⁴⁶ The yield curve on U.S. Treasury bonds relates the yield to its time to maturity. We say the current yield curve is steep because the difference in yield between short-term (near 0%) and long-term (over 1%) bonds is large in percentage terms.

1 of August 31, 2021 and weighted averages over the 3 months ending on that date for these
2 two yields.

3 As outlined in Exhibit ALR-4, page 2, my spot and weighted average short-term
4 risk-free rates are 0.04% and 0.05%, respectively. My spot and weighted average long-
5 term risk-free rates are 1.92% and 1.95%, respectively.

6 U.S. government bonds are reasonable to use as a risk-free rate because they have
7 a negligible risk of default. The value of short-term U.S. Treasury bills has a relatively
8 low exposure to swings in the overall market. The value of long-term U.S. Treasury bonds
9 is relatively more exposed to the market and therefore must be used with caution. I
10 considered using a risk-free rate based on subtracting the historical spread between long-
11 term and short-term U.S. Treasury bills from current long-term yields, as recommended by
12 some financial textbooks.⁴⁷ I did not use this method because in the current capital markets,
13 this method results in an unreasonably low risk-free rate (under 0%).

14 Regarding my weighted average risk-free rates, it is worth noting that any form of
15 averaging or weighting approach applied to the last 12 months of historical yield data
16 would not have any significant effect on my CAPM results.

17 **Q. WHAT IS YOUR RESPONSE TO ANALYSTS WHO CLAIM THAT THE CAPM**
18 **MUST BE IMPLEMENTED WITH A LONG-TERM INTEREST RATE (E.G.,**

⁴⁷ Brealey, Myers, and Allen (2017), *Principles of Corporate Finance*, 12th Edition, McGraw-Hill Irwin, New York, page 228.

YIELD ON 30-YEAR TREASURY BOND) AS AN ESTIMATE OF THE RISK-FREE RATE COMPONENT OF THE CAPM?

A. When looking for a security to calculate an estimate of the risk-free rate, it could be argued that it is appropriate to find one with a term or maturity that best matches the life of the asset being financed. In that sense, the 30-year Treasury bond yield can be argued to be ideal for this specific application. However, it is equally important to find a security that has a beta coefficient with the overall market as close to zero as possible, because by the very definition of the risk-free rate in the CAPM model, its movements should have no correlation to the movements of the market. And this is where the problem with the 30-year Treasury bond yield arises, as it has an established non-zero beta. The 3-month Treasury bill yield has a considerably lower beta, and therefore is superior in that respect to the 30-year Treasury bond yield. Neither one is a perfect fit on both fronts, which is why I have chosen to consider both as proxies for the risk-free rate to establish a range for my CAPM results.

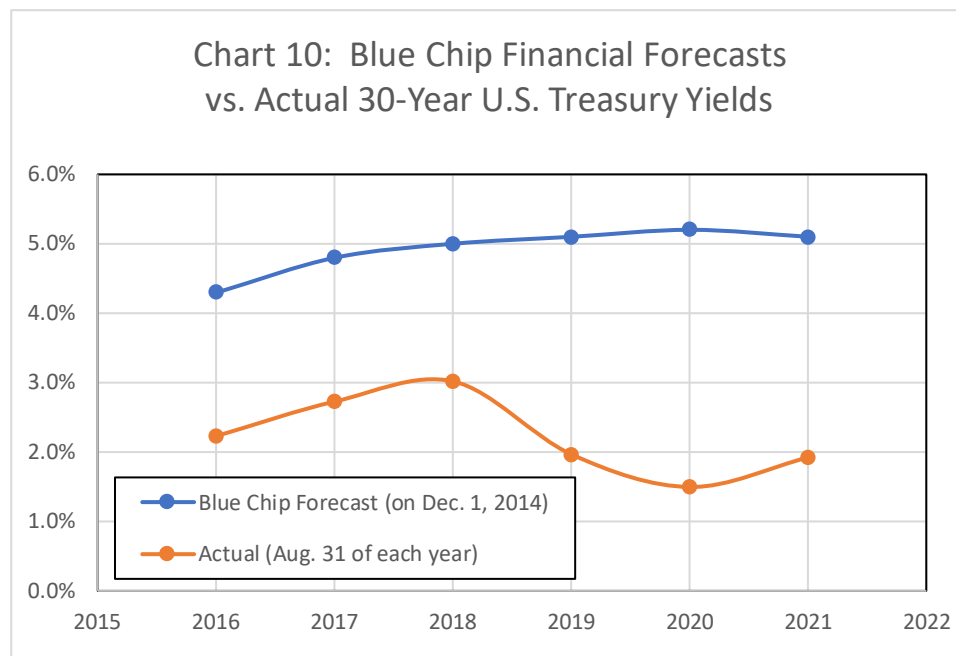
Q. HOW DO YOU RESPOND TO ANALYSTS WHO CLAIM THAT THE RISK-FREE RATE SHOULD BE BASED ON INTEREST RATE FORECASTS FROM FIRMS SUCH AS BLUE CHIP FINANCIAL?

A. It is important to recognize that current long-term Treasury bond yields represent a direct observation of investor expectations and there is no need to use “expert” forecasts such as Blue Chip to determine the appropriate risk-free rate to use in a CAPM analysis or any other cost of equity calculations.

Many economists and forecasters will continue to be quoted in the press prognosticating on possible developments that are truly unpredictable. The Nobel Laureate Economist Daniel Kahneman stated the following regarding forecasting:

It is wise to take admissions of uncertainty seriously, but declarations of high confidence mainly tell you that an individual has constructed a coherent story in his mind, not necessarily that the story is true.⁴⁸

As Chart 10 below shows, Blue Chip Financial forecasted in 2014 that 30-Year U.S. Treasury bonds would be over 5% by 2018 while in fact they turned out to be under 2%.



The time covered in Chart 10 above was chosen to provide a concrete example. Blue Chip's interest rate forecasts have been persistently inaccurate. A recent paper published by the Congressional Budget Office determined Blue Chip consensus forecasts

⁴⁸ Daniel Kahneman, *Thinking Fast and Slow* (New York: Farrar, Straus, and Giroux, 2011): 212.

exhibited “significant positive bias” between 1984 and 2012 and “have become more biased and less accurate over time.”⁴⁹

Beta

Q. WHAT BETA DID YOU USE IN YOUR CAPM?

A. Since the cost of equity should be based on investor expectations, I chose to use two betas. My “forward beta” is based on forward-looking investor expectations of non-diversifiable risk. My “hybrid beta” is based on both forward-looking investor expectations and historical return data.

Most published betas are based exclusively on historical return data. For example, Value Line publishes a 5-year historical beta for each of the companies it covers. However, it is also possible to calculate betas based on investors’ expectations of the probability distribution of future returns. This probability distribution of future returns expected by investors can be calculated based on the market prices of stock options.

Q. WHAT IS A STOCK OPTION?

A. A stock option is the right to buy or sell a stock at a specific price for a specified amount of time. A call option is the right to buy a stock at a specified exercise or strike price on or before a maturity date. A put option is the right to sell a stock at a specified exercise or strike price on or before a maturity date. For example, a call option to purchase Apple Computer stock for \$230 on January 17, 2020 allows the owner the option (not the obligation) to buy Apple stock for \$230 on that date. At the end of July 2019, Apple stock was trading at about \$215 per share. Why would anyone pay for the right to buy a stock

⁴⁹ *Did Treasury Debt Markets Anticipate the Persistent Decline in Long-Term Interest Rates?*, Congressional Budget Office, Edward N. Gamber, page 2. This paper can be found at: <https://www.cbo.gov/system/files/115th-congress-2017-2018/workingpaper/53153-interestrateswp.pdf>

1 higher than the current price? Investors who purchased those call options thought there
2 was a chance Apple stock would be trading higher than \$230 on January 17, 2020, and
3 those options gave those investors the right to buy Apple stock for \$230 and profit by
4 selling it at the market price on that date, if it was higher. The price of Apple's stock was
5 \$317.98 at the close of trading on January 17, 2020. Therefore, the investor who purchased
6 this call option for \$635 on July 31, 2019 earned a profit of \$8,163⁵⁰ at expiry on January
7 17, 2020. On the other hand, the investor who purchased an Apple put option with the
8 same expiration date and strike price on July 31, 2019 would have lost the price of the
9 option (\$2,248) and gained nothing on the expiration date because the right to sell Apple
10 stock for \$230 when the price is over \$300 is worthless.

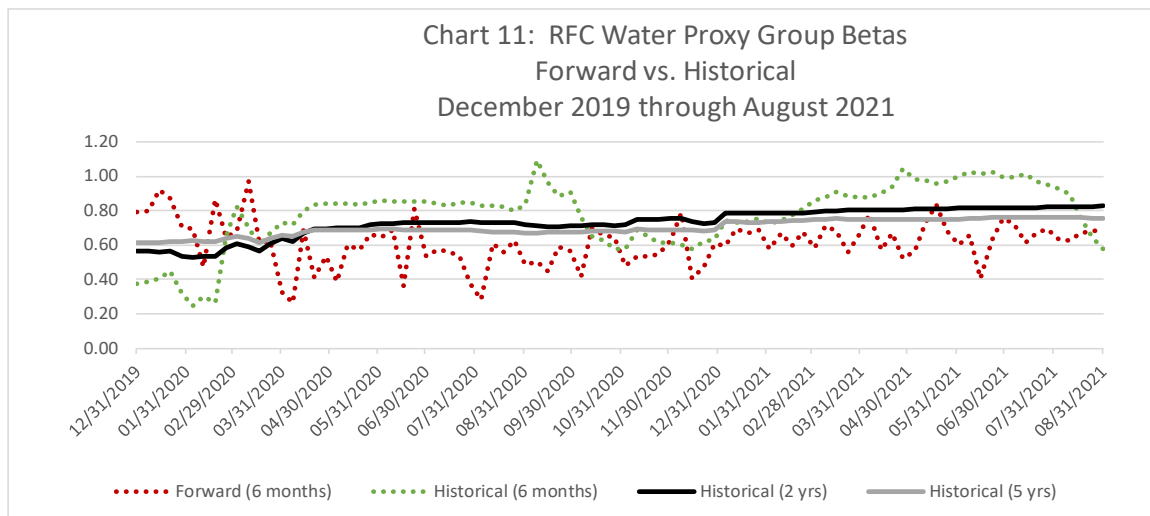
11 The market prices of put options and call options provide information regarding the
12 probability distribution of future stock prices expected by investors. Using established
13 techniques, I am able to use price data for stock options of my RFC Water Proxy Group
14 companies and the S&P 500 Index to determine investors' return expectations, including
15 the relationship (covariance) between the return expectations for individual RFC Water
16 Proxy Group companies and those for the overall market (S&P 500). This covariance
17 between the expected returns for my RFC Water Proxy Group and for the S&P 500
18 indicates what investors expect betas will be in the future. I refer to betas based on option
19 price calculations as "option-implied betas."

⁵⁰ \$8,163 profit from exercising call option (\$31,798 from selling at \$317.98 market price - \$23,000 cost to purchase at \$230) - \$635 (\$6.35 X 100) option purchase price. Note: Each call option is the right to purchase 100 shares.

Q. PLEASE EXPLAIN HOW YOU CALCULATED THE BETAS USED IN YOUR CAPM.

A. Traditionally, the betas used in CAPM calculations are calculated from historical returns. This approach has strengths and weaknesses. An alternative way to calculate betas is to incorporate investors' return expectations by calculating option-implied betas as explained in the previous paragraph. As discussed below, I have chosen to use both historical and option-implied betas in my CAPM analysis. I chose to use option-implied betas in my CAPM analysis because, among other reasons, studies have found that betas calculated based on investor expectations (option-implied) provide information regarding future perceived risks and expectations.⁵¹

As shown in Chart 11 below, stock option prices indicate that investors likely expect lower betas for the RFC Water Proxy Group in the future.



⁵¹ Bo-Young Chang & Peter Christoffersen & Kris Jacobs & Gregory Vainberg. (2011) Option-Implied Measures of Equity Risk, *Review of Finance* 16: 385-428.

Exhibit ALR-4, page 3 contains the last three months of data used in creating Chart 11 on page 62, which is what I use in my CAPM analysis. Specifically, I use the following two betas in my CAPM analysis:

1. **Hybrid Beta:** 50% Option-Implied Beta (6 months) + 25% Historical Beta (6 months) + 15% Historical Beta (2 years) + 10% Historical Beta (5 years).
2. **Forward Beta:** 100% Option-Implied Beta (6 months).

Q. PLEASE EXPLAIN HOW YOU CALCULATE HISTORICAL BETAS.

A. I calculate historical betas following the methodology used by Value Line, with some modifications. Specifically, Value Line adheres to the following guidelines:

1. Returns for each security are regressed against returns for the overall market in the following form:

$$\ln(p^I_t / p^I_{t-1}) = a_I + B_I * \ln(p^m_t / p^m_{t-1})$$

Where:

- p^I_t is the price of the security I at time t
 - p^I_{t-1} is the price of the security I one week before time t
 - p^m_t and p^m_{t-1} are the corresponding values of the market index
 - B_I is the regression estimate of Beta for the security against the market index
2. The natural log of the price ratio is used as an approximation of each return and no adjustment is made for dividends paid during the week.
 3. Weekly returns are calculated on one day of the week, with a stated preference for Tuesdays to minimize the effect of holidays as much as possible.

1 4. Betas calculated using the regression method above are adjusted as per
2 Blume (1971)⁵² using the following formula:

$$\text{Adjusted } B_I = 0.35 + 0.67 * \text{Calculated } B_I$$

3
4 There are four differences between my historical beta calculations and Value Line's
5 calculations:

6 1. The first significant difference is that whereas Value Line uses the New
7 York Stock Exchange Composite Index as the market index, I use the S&P
8 500 Index.

9 2. Another important difference is that whereas Value Line calculates weekly
10 returns on one day of the week, with a stated preference for Tuesdays, I
11 calculate weekly returns on all days of the week.

12 3. Value Line only calculates betas every 3 months in their quarterly company
13 reports, whereas I use the same consistent methodology to calculate betas
14 every week during the most recent 3 complete months (June through August
15 2021).

16 4. Value Line always uses a 5-year period for the return regression,⁵³ whereas
17 I calculate historical betas for periods of 6 months, 2 years, and 5 years, as
18 shown in Chart 11 on page 62.

19 In the following pages, I explain my rationale for making the four modifications
20 above to Value Line's beta calculation methodology.

⁵² M. Blume, On the Assessment of Risk, *The Journal of Finance*, Vol. XXVI, March 1971.

⁵³ They offer betas calculated over different time periods on their website, including 3 years and 10 years.

1 **Q. WHY DO YOU CALCULATE YOUR HISTORICAL BETAS VS. THE S&P 500**
2 **INDEX INSTEAD OF THE NYSE COMPOSITE INDEX, AS VALUE LINE DOES?**

3 **A.** A critical factor in the calculation of a beta coefficient is the choice of index to represent
4 the overall market. Using exactly the same beta calculation methodology with a different
5 market index will result in different values of beta for a given company or portfolio --
6 sometimes drastically different values. It is easy to jump to the conclusion that this points
7 to a flaw in CAPM theory, as different values of beta would result in a different implied
8 cost of equity. However, another key component of the CAPM, the market risk premium,
9 also depends on the choice of the market index, which in theory would have an offsetting
10 effect on the cost of equity calculation. This points to the most important aspect of
11 selecting a market index for a CAPM analysis, which is to be consistent and use the same
12 index for the calculation of beta as for the calculation of the market risk premium. This is
13 a fundamental concept of the CAPM and using betas based on one index with a market risk
14 premium based on a different index yields invalid results.

15 As stated above, Value Line calculates its published betas based on the NYSE
16 Composite Index. Most methodologies used to calculate the market risk premium,
17 including those I rely on, are based on the S&P 500 Index, so using them in the CAPM
18 together with Value Line betas exactly as published would yield invalid results.

19 For this reason, I calculate my historical betas versus the S&P 500 Index, making
20 my CAPM approach entirely consistent. This is in contrast to Mr. Moul's approach, which
21 mixes betas based on a different index (NYSC) than his equity risk premium component
22 (S&P 500), rendering his CAPM results inconsistent and unreliable.

1 As an aside related to my option-implied betas, using the S&P 500 Index
2 consistently throughout my CAPM has the added benefit that this index has a much larger
3 number of options traded, which makes the calculation of option-implied betas more
4 reliable.

5 **Q. WHY DO YOU CALCULATE YOUR HISTORICAL BETAS USING WEEKLY**
6 **RETURNS ON EVERY DAY OF THE WEEK AS OPPOSED TO USING ONLY**
7 **ONE DAY OF THE WEEK, AS VALUE LINE DOES?**

8 **A.** Using one day of the week to calculate weekly returns for use in the regression analysis
9 used to calculate historical betas has the unintended effect of generating different values of
10 betas depending on the day of the week that is used. To clarify, if one were to use Value
11 Line's precise methodology for calculating a 5-year historical beta for a given company
12 using weekly returns calculated on Tuesdays, the resulting beta value would be different
13 than the resulting value if one were to use the same exact methodology, but using weekly
14 returns calculated on Wednesdays, or any other day of the week. Even though 5-year
15 historical betas should in theory be quite stable and should not change very much from one
16 day to the next, calculating returns on only one day of the week results in differences that
17 can be significant and make no sense conceptually.

18 I only became aware of this side-effect recently, but it is easy to understand why it
19 happens. Even though there is some correlation due to some overlap, the set of weekly
20 returns calculated on Mondays is a completely different set of numbers than the set of
21 weekly returns calculated on Tuesdays. As a result, there are five 5-year betas that can
22 result from Value Line's methodology, and even though the Monday beta for a given

1 company will change slowly from week to week, the change between the Monday beta and
2 the Tuesday beta, calculated just one trading day apart, can be quite significant.

3 Since I became aware of this undesirable effect, I began calculating my historical
4 betas based on an all-encompassing set of weekly returns calculated on every trading day
5 in the beta calculation period. This methodology has the effect of averaging out the five
6 possible betas that could result from using only one day of the week for the return
7 calculations,⁵⁴ as Value Line does. In this way, a 5-year beta calculated on any two
8 consecutive trading days would only change minimally, as it should.

9 Using a daily calculation of weekly returns could be criticized for the resulting
10 overlap in a weekly return from Monday to Monday with that from Tuesday to Tuesday.
11 However, given that the overlap is consistent and equal for the net effect of every trading
12 day, no trading day is given undue weight in the regression. Even though the effect of each
13 trading day appears 5 times in the weekly return data, there are also 5 times the total number
14 of weekly returns in the overall set used in the regression, so any individual trading day
15 has the same relative weight than in Value Line's methodology. The fact that the resulting
16 beta value of this aggregate approach turns out to be a sort of average of the five possible
17 values that would result from Value Line's methodology on different days of the week is
18 the final confirmation that this is the superior approach for calculating a historical beta
19 based on weekly returns.

20 Using a daily calculation of weekly returns has the added marginal benefit of
21 providing more data pairs to be used in historical beta calculations for shorter periods, such

⁵⁴ The resulting beta is not a direct arithmetic or geometric average of the other five betas, but rather a regression based on the union of all five possible sets of weekly returns.

as for 6-month historical betas, where instead of 25 return pairs, the regression is performed on 117 return pairs.

Q. ARE THERE ADDITIONAL BENEFITS TO DOING YOUR OWN HISTORICAL BETA CALCULATIONS?

A. Doing my own historical beta calculations using Value Line's established methodology allows me to see how beta values change from week to week and to use the most up-to-date beta calculations instead of relying on stale beta values that can be more than 3 months old.

Q. WHY DO YOU USE PERIODS OF 6 MONTHS, 2 YEARS, AND 5 YEARS FOR YOUR HISTORICAL BETA CALCULATIONS, AS OPPOSED TO RELYING EXCLUSIVELY ON THE 5-YEAR PERIOD USED BY VALUE LINE?

A. Using shorter periods for the return regression analysis portion of the historical beta calculation allows me to see if the correlation between the returns of each of the companies in my RFC Water Proxy Group and those of the S&P 500 Index has changed in the last 2 years or 6 months. Using a 5-year period exclusively tends to make recent changes in the correlation more difficult to identify because of the weight of 5 years of data.

Q. WOULD YOU AGREE THAT CHANGES IN MARKET DYNAMICS WILL HAVE A LARGER EFFECT ON 6-MONTH HISTORICAL BETAS THAN THEY WILL ON 2-YEAR OR 5-YEAR HISTORICAL BETAS?

A. Yes. As with other historical metrics based on a given time period, say, average stock prices, the longer the time horizon under consideration, the more data points are considered, and the smaller the effect of any one given change in the data set.

1 **Q. IS THIS LARGER EFFECT ON 6-MONTH HISTORICAL BETAS FROM**
2 **CHANGES IN MARKET DYNAMICS A GOOD OR A BAD THING?**

3 **A.** The answer depends on what the beta will be used for. I would argue that in any attempt
4 to forecast the beta coefficient of a company for any forward-looking analysis such as the
5 cost of capital calculations in this proceeding, more recent historical data should be given
6 more relevance than data from 5 or 10 years ago. The weight of 10 years of data makes a
7 beta coefficient react extremely slowly to market developments. Even pronounced
8 permanent market changes can take more than 6 months to have a detectable effect on a
9 10-year beta.

10 As with using spot values and averages of historical market data, I believe the right
11 answer is not to use *either* 6-month historical betas or historical betas with longer horizons,
12 but to consider *both*. For this reason, I have created my hybrid betas, which take into
13 consideration 6-month, 2-year, and 5-year historical betas along with forward-looking,
14 option-implied betas.

15 **Q. DO YOU THINK IT IS A GOOD IDEA TO RELY ON 6-MONTH HISTORICAL**
16 **BETAS DESPITE MARKET DEVELOPMENTS IN THE PAST YEAR THAT**
17 **SOME WOULD CALL “MARKET DISLOCATIONS?”**

18 **A.** Financial markets are constantly in flux due to the influence of countless factors. What
19 some people may refer to as “market dislocations,” though arguably more significant, I
20 would say are just some of the numerous factors that are constantly affecting markets. To
21 attempt to separate any one specific factor from “real” underlying market dynamics would
22 be an exercise in futility.

1 Furthermore, it is very difficult if not impossible for anyone to predict how long
2 any one influencing factor will be present or how long its effects will be felt by financial
3 markets. When interest rates came down to historical lows in 2008, many analysts referred
4 to it as an aberration that would be short-lived. Twelve years later, rates have not only
5 remained low, but have come down even further due to yet another unexpected event.
6 COVID-19 affected markets tumultuously, and though the initial wall of the tsunami has
7 passed, no one can say for sure if its direct fallout and the effects of its reverberations or a
8 resurgence will continue to affect financial markets for months or years to come.

9 So, in response, yes, I think it is a good idea to use 6-month historical betas to
10 measure recent and current market dynamics regardless of recent developments. I use them
11 as part of my hybrid betas in conjunction with longer-term historical betas and forward-
12 looking, option-implied betas to achieve the most reasonable result.

13 Speaking specifically about the most significant initial impact caused of the onset
14 of the COVID-19 pandemic in March 2020, it should be pointed out that 6-month betas
15 calculated in the past 3 months no longer cover that period of time.

16 **Q. GIVEN THE SHORTER PERIOD COVERED BY 6-MONTH HISTORICAL**
17 **BETAS, CAN THEY STILL BE CONSIDERED STATISTICALLY**
18 **SIGNIFICANT? HOW MANY DATA POINT PAIRS ARE USED IN THE**
19 **CALCULATION OF YOUR 6-MONTH HISTORICAL BETA COEFFICIENTS?**

20 **A.** A 6-month historical beta based on weekly returns calculated weekly is calculated using
21 26 closing price points for a company and for its corresponding market index, in this case
22 the S&P 500 Index. This translates into 25 pairs of return data that are then used in the

1 regression analysis. This is most certainly enough data to achieve statistical significance
2 as addressed further below.

3 Furthermore, as stated above, the recent improvement in my calculation of
4 historical betas of using weekly returns on every day of the week as opposed to using only
5 one day of the week, as Value Line does, has the added benefit of providing significantly
6 more data pairs to be used in the regression analysis used to calculate beta. For 6-month
7 historical betas, instead of relying on 25 return pairs, the regression is performed on 117
8 return pairs.

9 **Q. HOW MANY DATA POINT PAIRS ARE NECESSARY TO ESTABLISH A**
10 **STATISTICALLY SIGNIFICANT CORRELATION BETWEEN TWO**
11 **VARIABLES IN A REGRESSION ANALYSIS, SUCH AS THE ONE USED TO**
12 **ESTABLISH BETA COEFFICIENTS?**

13 **A.** Establishing a minimum number is somewhat subjective, though various authorities on
14 statistics argue the number is between 3 and 8 data pairs. While one can broadly correctly
15 generalize that the more data point pairs one uses, the more certain one can be about the
16 significance of the results of any correlation analysis, this is very different from stating that
17 one cannot achieve statistical significance with a relatively low number of data pairs. In
18 fact, it is important to realize that one can achieve statistical significance with less than 10
19 data pairs, and that even hundreds of data pairs do not guarantee statistical significance.
20 For precisely this reason, statisticians have developed a tool that helps determine statistical
21 significance based on the number of data pairs in a regression analysis.

1 A “table of critical values” of Pearson’s correlation, which can be readily found
2 online⁵⁵ or in most statistics books, tells a statistician that for 25 data point pairs (implying
3 $N-2=23$ “degrees of freedom”), a correlation, or beta, coefficient of 0.505 or higher will
4 occur *by chance* with a probability of only 0.01.⁵⁶ As explained in more detail in the text
5 regarding how to use the table of critical values,⁵⁷ any beta coefficient above this level, and
6 certainly above the 0.842 3-month average for the recent 6-month betas for my RFC Water
7 Proxy Group, by definition are considered statistically significant. The threshold for
8 statistical significance for 117 data point pairs (implying 115 “degrees of freedom”), is so
9 low that it is not even included in the table of critical values. The maximum “degrees of
10 freedom” listed is 100, with an already very low threshold of 0.254.

11 **Q. PLEASE EXPLAIN HOW YOU CALCULATED OPTION-IMPLIED BETAS.**

12 **A.** Calculating option-implied betas of a company requires (1) obtaining stock option data for
13 that company and a market index, (2) filtering the stock option data, (3) calculating the
14 option-implied volatility for the company and for the index, (4) calculating the option-
15 implied skewness for the company and for the index, and (5) calculating option-implied
16 betas for the company based on implied volatility and skewness for the company and for
17 the index. There are various ways one could choose to perform the steps above, but I chose
18 to filter stock option data and calculate option-implied volatility⁵⁸ and skewness⁵⁹
19 following exactly the same methodology used by the Chicago Board of Options Exchange

⁵⁵ E.g., https://researchbasics.education.uconn.edu/r_critical_value_table/#

⁵⁶ In fact, many researchers use a more lenient “alpha level” of 0.05 for determinations of statistical significance.

⁵⁷ https://researchbasics.education.uconn.edu/statistical_significance/

⁵⁸ CBOE Volatility Index White Paper, 2018. Please note that the cover page says, “proprietary information.” However, this document has been in the public domain for over 3 years.

⁵⁹ The CBOE SKEW Index, 2010. Please note that the cover page says, “proprietary information.” However, this document has been in the public domain for over 3 years.

1 (CBOE) in the calculation of their widely-used VIX (or Volatility Index) and SKEW Index,
2 respectively.

3 I start my process with publicly available trading information for all the options for
4 a given security (company or index) for a complete trading day. I then filter the option
5 data as described by the CBOE using the following guidelines:

- 6 1. Use the mid-quote or mark (average of bid and ask) as the option price.
- 7 2. Use only out-of-the-money call and put options.
 - 8 • Determine the “moneyness” threshold where absolute difference
 - 9 between call and put prices is smallest (using CBOE “Forward Index
 - 10 Price” formula).
 - 11 • Include “at-the-money” call and put options and use average of call
 - 12 and put prices as price for “blended” option.
- 13 3. Exclude all zero bids.
- 14 4. Exclude remaining (more out-of-the-money) options when two sequential
- 15 zero bids are found.

16 I then apply the series of formulas clearly described in both of the CBOE’s white
17 papers to the remaining options to calculate Option-Implied Volatility and Option-Implied
18 Skewness. In the words of the CBOE, each of its two indices is “an amalgam of the
19 information reflected in the prices of all of the selected options.” To be clear, Implied
20 Volatility is not exactly the same as the VIX Index, and Implied Skewness is not exactly
21 the same as the SKEW Index, but both indices are directly based on their corresponding
22 statistical value.

Option-Implied Volatility reflects investors' expectations regarding future stock price movements. Option-Implied Skewness reflects investors' expectations regarding how implied volatility changes for strike prices that are closer and further to the current value of the underlying stock price.

The CBOE calculates Times to Expiration by the minute—as do I. The Time to Expiration of traded options cannot be changed and varies from day to day. For the sake of consistency, the CBOE calculates the VIX and SKEW indices on a “30-day” basis by interpolating for two sets of options with Times to Expiration closest to the 30-day mark. I prefer to focus on as long of a time horizon as possible for forecasting purposes. Option Times to Expiration vary significantly for various stocks but can relatively consistently be found to go out to 6 months (180 days) for utility companies. Therefore, for the sake of consistency, I have chosen to interpolate to calculate 6-month volatility and skewness where possible. Occasionally, Times to Expiration for a given stock do not go out to 180 days. If the greatest Time to Expiration available is 171 days (95%) or greater, I use the volatility and skewness for that group of options as a proxy for the 180-day volatility and skewness, respectively.

Finally, once I have calculated the option-implied volatility and skewness for each company and index using the methodology described above, I calculate option-implied betas using the following formula developed by Christoffersen, Chang, Jacobs and Vainberg (2011):⁶⁰

$$\beta_i = \left(\frac{SKEW_i}{SKEW_m} \right)^{1/3} \left(\frac{VAR_i}{VAR_m} \right)^{1/2}$$

⁶⁰ Bo-Young Chang & Peter Christoffersen & Kris Jacobs & Gregory Vainberg. (2011) Option-Implied Measures of Equity Risk, *Review of Finance* 16: 385-428.

Where:

β_i : option – implied beta of security (e.g. stock, fund);
 $SKEW_i$: skewness of security;
 $SKEW_m$: skewness of overall market (S&P 500);
 VAR_i : variance of company;
 VAR_m : variance of overall market (S&P 500).

Q. YOU CALCULATE YOUR OPTION-IMPLIED BETAS BASED ON A 6-MONTH HORIZON. WOULD IT NOT BE BETTER TO USE A LONGER FORECASTING HORIZON?

A. The methodology I use to calculate my option-implied betas “allows for the computation of a complete term structure of beta for each company so long as the options data are available,”⁶¹ so there is nothing inherent in the methodology that limits it to a certain time horizon.

For many applications, including cost of capital, one could argue that the longer the time horizon for the option-implied betas, the better. However, the limitation on the forecasting horizon is always set by the longest expiration period of the options currently traded in the market. Some companies trade options with expiration periods up to 2 or 3 years into the future. As evidenced by the exhaustive option data in my working papers, the maximum expiration period for the options of the companies in my RFC Water Proxy Group is approximately 8 months. None of the 7 companies ever trade options with expiration periods of more than 8 months. New options are issued roughly every 3 months for all of these companies, so the maximum expiration period on any given trading day is somewhere between 5 and 8 months. For consistency across companies in my proxy group and across dates within the 3-month period on which my analysis is focused (June through

⁶¹ Peter Christoffersen, Kris Jacobs, and Gregory Vainberg, *Forward-Looking Betas*, April 25, 2008, Page 24.

1 August 2021), I chose to use 6 months for the time horizon of my option-implied betas. If
2 the maximum expiration period for the options of a given company on a given day is less
3 than 6 months, I use the maximum expiration period as an approximation for the target 6-
4 month horizon.

5 Simply because some may argue that it may be preferable to use longer time
6 horizons in place of or in addition to a 6-month horizon, it does not mean that a 6-month
7 option-implied beta is of no relevance or cannot be used. That would be tantamount to
8 saying you cannot use a 1-year Value Line Earnings Per Share estimate, or that the
9 minimum relevant forecast is 2 or 3 years. In fact, for purposes of option-implied betas, it
10 would be difficult to say if a time horizon of 1 year, for instance, is necessarily always
11 better than a time horizon of 6 months. An option-implied forward-looking beta, even with
12 a time horizon of less than 6 months, is still a useful tool in interpreting the current
13 expectations of investors at any given time.

14 A final strong argument in support of using 6-month option-implied betas in a cost
15 of capital calculation looking years into the future is that, as expanded upon on page 78,
16 the authors of the paper on which I based my option-implied betas concluded that their
17 predictive powers are not limited to 6 months into the future. In fact, they conclude that 6-
18 month option-implied betas have stronger predictive power than 6-month, 1-year, or 5-year
19 historical betas when attempting to forecast betas 1 or 2 years into the future.

1 **Q. WHY DIDN'T YOU USE LONG-TERM EQUITY ANTICIPATION SECURITIES,**
2 **WHICH ARE OPTIONS CONTRACTS WITH AN EXPIRATION DATE OF**
3 **TYPICALLY MORE THAN 1 YEAR?**

4 **A.** It is not possible to use Long-Term Equity Anticipation Securities (LEAPS) to calculate
5 option-implied betas for all utility companies because these contracts are not traded for
6 many of them. As stated above, the maximum expiration period for the options of the 7
7 companies in my RFC Water Proxy Group is approximately 8 months, and so for
8 consistency across companies and dates, I chose to use 6 months for the time horizon of
9 my option-implied betas. As explained above, option-implied betas calculated from
10 options contracts with expiration periods less than 1 year, in my case 6 months, are still a
11 useful tool in interpreting investors' current expectations and are superior to the historical
12 betas. As a further note, I use LEAPS in my CAPM when the data is available. The risk
13 premium portion of my CAPM is based on options contracts with expiration periods
14 exceeding 1 year, and as far out as 30 months.

15 **Q. HOW DID YOU DECIDE ON THE RELATIVE WEIGHTS YOU ALLOCATE TO**
16 **EACH COMPONENT OF YOUR HYBRID BETAS? IS THERE ANY ACADEMIC**
17 **SUPPORT FOR YOUR APPROACH?**

18 **A.** I am not aware of any academic study specifically focused on the optimal relative weight
19 of historical betas to predict future betas. However, the authors of the paper I relied upon
20 for guidance on the calculation of my option-implied betas did attempt to quantify the
21 predictive power of 6-month option-implied ("forward-looking") betas as well as that of 6-
22 month ("180-day"), 1-year, and 5-year historical betas by back-testing historical
23 predictions with actual *expost* results, or "realized" betas, for the 30 companies in the Dow

1 Jones Index. In addition to using each of the betas above independently, they also
2 measured the predictive power of a “mixed” beta consisting of a simple average of the six-
3 month option-implied beta and the 6-month historical beta.

4 Their conclusions for predicting 6-month future betas are as follows:

5 The forward-looking beta outperforms the other methods ten times, and the
6 same is true for the 180-day historical beta. The mixed beta is the best
7 performer in seven cases, and the 1-year historical beta in three cases. The
8 5-year historical beta is always outperformed by at least one other method,
9 and it often ranks last. The 180-day historical beta clearly dominates the
10 two other historical methods.⁶²

11 Their conclusions for predicting 1-year and 2-year future betas are as follows:

12 Somewhat unexpectedly, the performance of the forward-looking beta
13 compared to that of the 180-day historical beta is much better [for the one-
14 year prediction] than [for the six-month prediction], and this conclusion
15 carries over to [the two-year prediction]. The mixed beta also perform [sic]
16 well. It is perhaps not surprising that the performance of the 180-day
17 historical beta [for the one- and two-year predictions] is poorer than [for the
18 six-month prediction], because the horizons used in the construction of
19 realized betas are no longer equal to 180 days. What is harder to explain is
20 why the correlation between realized beta and forward-looking beta is in
21 many cases higher [for the one- and two-year predictions] than [for the six-
22 month prediction]. Finally, it is also interesting that the 1-year and 5-year
23 historical betas do not perform well [for the one-and two-year predictions].
24 In summary, [for the one-year prediction] either the forward-looking beta
25 or the mixed beta is the best performer in nineteen out of thirty cases. [For
26 the two-year prediction], this the case twenty-two times out of thirty.⁶³

27 Their conclusions strongly support the use of 6-month historical betas, 6-month
28 option-implied betas, and/or an average of the two as predictors of future betas 6 months,
29 1 year, or 2 years into the future. They also seem to indicate that historical betas lose
30 predictive power the longer the period that is used.

⁶² Peter Christoffersen, Kris Jacobs, and Gregory Vainberg, *Forward-Looking Betas*, April 25, 2008, Page 16.

⁶³ Peter Christoffersen, Kris Jacobs, and Gregory Vainberg, *Forward-Looking Betas*, April 25, 2008, Page 17.

I decided on the composition of my hybrid betas primarily based on the conclusions of the authors above. A mixed or hybrid beta made up of 50% historical betas and 50% forward-looking option-implied betas seemed to be the best way to go. Though the predictive power of longer-term historical betas seems to be quite reduced, it is not zero, so in an effort to preserve the effect of longer-term market trends in my hybrid betas, I chose to further subdivide the historical component into 50% (25% of the hybrid) for the stronger predicting 6-month historical betas, 30% (15% of the hybrid) for the 2-year historical betas, and 20% (10% of the hybrid) for the 5-year historical betas.

Market Risk Premium

Q. PLEASE EXPLAIN HOW YOU CALCULATED THE EQUITY RISK PREMIUM USED IN YOUR CAPM.

A. Traditionally, the risk premium used in CAPM calculations is derived from historical returns and/or equity analyst projections. The former approach is historically accurate but does not take into account investors' expectations for future market risks and returns. The latter approach is based on analyst projections, which are not market-based and do not reflect current investor expectations. A superior market-based way to calculate the equity risk premium is to use option-implied return expectations, which is the approach I have used.

My equity risk premium is the expected return on the S&P 500 minus the risk-free rate. I calculate an expected return on the S&P 500 by using stock options traded on this index. To begin with, I use exactly the same methodology used by the Chicago Board of Options Exchange to filter stock option data and calculate option-implied volatility and

1 skewness,⁶⁴ as described in detail in the Beta section on page 72. The volatility and
2 skewness calculated in this way describe a probability function representing the possible
3 trajectories for the S&P 500 implied by the options market. The resulting skewed
4 probability function can be closely approximated by a log-normal function using
5 established statistical formulas, which then make it straightforward to calculate the
6 expected growth for the S&P 500 for any given cumulative probability. A cumulative
7 probability of 50% represents the median of the probability distribution, or the option-
8 implied market consensus, which is how I arrive at my calculation of expected market
9 growth.

10 Once the option-implied growth rate of the S&P 500 has been estimated as
11 described above, I add the dividend yield and subtract the risk-free rate to arrive at the
12 market risk premium, as laid out in Exhibit ALR-4, page 4 and Exhibit ALR-4, page 6. In
13 line with my Spot and Weighted Average CAPM approaches, I use both spot values as of
14 August 31, 2021 and weighted averages over the 3 months ending on that date for option-
15 implied growth, dividend yields, and short- and long-term risk-free rates in these
16 calculations to arrive at a total of 4 estimated values for the market risk premium. The
17 market risk premium I use in my Weighted Average CAPM analysis with short- and long-
18 term risk-free rates is 9.08% and 7.18%, respectively. The market risk premium I use in
19 my Spot CAPM analysis with short- and long-term risk-free rates is 9.00% and 7.12%,
20 respectively.

⁶⁴ As used in the calculation of their widely-used VIX (or Volatility Index) and SKEW Index, respectively.

1 **Q. DID YOU TAKE INTO CONSIDERATION THE DIFFERENCE IN**
2 **VOLATILITIES ACROSS EXPIRATION PERIODS IN THE OPTIONS TRADED**
3 **ON THE S&P 500?**

4 **A.** Yes. The volatility implied by the options market changes over time as investors'
5 perception of risk changes. For example, during a crisis, implied volatility generally
6 increases as investors expect that stock market prices have a greater chance of large swings
7 compared to times when there is no crisis. As discussed earlier, investors also often have
8 different volatility expectations over different time periods. For example, on any given
9 day, investors might expect volatility to be relatively high over the next 30 days and to
10 decrease over the next year or longer. The same holds true for skewness, even though it is
11 less intuitive to understand changes in skewness than in volatility. Because of these
12 changes across option expiration periods, I take a weighted average of the entire term
13 structure of the option-implied volatility and skewness, which for the S&P 500 typically
14 goes out to 24 to 36 months, interpolating where necessary, and giving the most weight to
15 the option expiration period of 12 months.

16 **Q. WHICH CUMULATIVE PROBABILITY DID YOU USE TO ESTIMATE THE**
17 **OPTION-IMPLIED GROWTH OF THE S&P 500 IN THE CALCULATION OF**
18 **YOUR MARKET RISK PREMIUM AND WHY?**

19 **A.** I used a cumulative probability of 50.0% in the calculation of my option-implied growth
20 for the S&P 500, which results in a value of 7.76% as of August 31, 2021 and a value of
21 7.82% for the weighted average of the 3 months ending on that date. As stated above, a
22 cumulative probability of 50% represents the median of the probability distribution, or in
23 this case the option-implied market consensus, which is why I have chosen to use this level.

1 As a matter of fact, using the same probability distribution derived from the options
2 market described above, one can also calculate the cumulative probability implied by a
3 given cost of capital. For instance, using the same risk-free rates and betas in my CAPM
4 analysis, PWR's requested rate of return on equity of 10.95% implies an average market
5 risk premium of 14.4%, an average overall market return of 15.4%, average growth for the
6 S&P 500 of 14.0%, and a cumulative probability of 68.4%. In other words, to achieve the
7 required market growth of 14.0%, reality would have to exceed 68.4% of the scenarios
8 investors currently see as plausible for the market in aggregate, considerably more than the
9 median market consensus at 50%. To put this into perspective, it is important to note that
10 values on the tails of the probability function get increasingly separated, requiring an ever-
11 increasing growth rate for every additional percentage in the cumulative probability, and
12 making it impossible to ever arrive at 100%.

13 Using exactly the same methodology, my 7.31% recommended cost of equity for
14 PWR implies an average market risk premium of 9.1%, an average overall market return
15 of 10.1%, average growth for the S&P 500 of 8.8%, and a cumulative probability of 52.5%.

16 **Q. ARE THE CUMULATIVE PROBABILITIES YOU REFER TO IN THIS CASE**
17 **DIRECTLY COMPARABLE TO THE CUMULATIVE PROBABILITIES YOU**
18 **HAVE USED OR REFERRED TO IN PRIOR TESTIMONIES YOU HAVE FILED?**

19 **A.** In late 2020, after significant efforts related to the complexities in processing extremely
20 large volumes of option data, I was finally able to use option-implied volatility and option-
21 implied skewness to come up with a log-normal function that approximates the probability
22 distribution of the possible trajectories for the S&P 500 implied by the options market as
23 of any given day, as explained above. All of the testimonies I have filed since then, starting

1 in 2021, have used this complete and superior approach along with a cumulative probability
2 of 50%, representing the median of the probability distribution, or the option-implied
3 market consensus, to estimate expected market growth. Any references to cumulative
4 probability in these testimonies are directly comparable.

5 Prior to incorporating skewness into the approximation, I used a normal function to
6 estimate the same probability distribution referred to above. Using a normal distribution
7 as an approximation is a simplification used commonly in economics, including in the
8 Black-Scholes formula for a single option. However, unlike a skewed log-normal function,
9 a normal function has the same median and mean, meaning that when applied in this case,
10 the option-implied market consensus of this simplified approximation implies market
11 growth of 0%. As a result, before using log-normal functions, I had to resort to finding an
12 adequate level of cumulative probability above 50% to estimate market growth, which is
13 admittedly somewhat subjective. To be conservative, I often used a cumulative probability
14 of 68.3%, which is the probability found within one standard deviation of the mean of a
15 normal distribution, which I understood would lead to a conservatively high estimate for
16 market growth. It is important to point out that the cumulative probabilities of the
17 simplified normal function approximation I used in cases before 2021 cannot be directly
18 compared to the cumulative probabilities of the superior log-normal function
19 approximation, which takes skewness into account. The considerably improved
20 approximation based on a log-normal function eliminates all subjectivity in arriving at the
21 implied market consensus and allows a much better measure of implied cumulative
22 probabilities of deviations from that market consensus.

CAPM Results

Q. PLEASE SUMMARIZE THE RESULTS OF YOUR CAPM.

A. Table 8 and Table 9 below show the results of my Weighted Average CAPM and Spot CAPM Analyses, respectively.

Weighted Average CAPM

TABLE 8: CAPITAL ASSET PRICING MODEL (CAPM) - INDICATED COST OF EQUITY WEIGHTED - All Inputs Weighted From June to August 2021				
	3-Month Treasury Bill		30-Year Treasury Bond	
	Hybrid Beta	Forward Beta	Hybrid Beta	Forward Beta
Risk-Free Rate	0.05%	0.05%	1.95%	1.95%
Beta	0.74	0.66	0.74	0.66
Risk Premium	9.08%	9.08%	7.18%	7.18%
CAPM	6.76%	6.04%	7.25%	6.68%

Source: Exhibit ALR-4, page 1

Spot CAPM

TABLE 9: CAPITAL ASSET PRICING MODEL (CAPM) - INDICATED COST OF EQUITY (SPOT) SPOT - All Inputs Based on Last Available Data as of August 31, 2021				
	3-Month Treasury Bill		30-Year Treasury Bond	
	Hybrid Beta	Forward Beta	Hybrid Beta	Forward Beta
Risk-Free Rate	0.04%	0.04%	1.92%	1.92%
Beta	0.69	0.69	0.69	0.69
Risk Premium	9.00%	9.00%	7.12%	7.12%
CAPM	6.22%	6.22%	6.81%	6.81%

Source: Exhibit ALR-4, page 5

VI. EVALUATION OF PWR'S RATE OF RETURN TESTIMONY

Q. PLEASE SUMMARIZE THE TESTIMONY OF MR. MOUL.

A. Mr. Moul has recommended that the Company be allowed a return on equity of 10.95%, a cost of debt of 3.79% and an overall cost of capital of 8.08%.⁶⁵ He arrived at his recommendation based upon his own versions of the Discounted Cash Flow ("DCF") model, Risk Premium ("RP") analysis, Capital Asset Pricing Model ("CAPM") and the Comparable Earnings ("CE") approach. Mr. Moul testified that, "At any point in time, any single method can provide an incomplete measure of the cost of equity depending upon extraneous factors that may influence market sentiment."⁶⁶ Mr. Moul claims it is necessary to add a leverage adjustment to his DCF result and a size adjustment to his CAPM method when the market-value and book-value capital structures are different in order to account for a risk differential.⁶⁷ The results of Mr. Moul's four cost of equity methods applied to his "Water Group" of 8 water utility companies are shown on Table 10 below.

TABLE 10: MR. MOUL'S COST OF EQUITY RESULTS				
METHOD	COE Result	Leverage Adjustment	Size Adjustment	Adjusted Common Equity Cost
DCF	9.44%	0.97%		10.41%
RP	10.50%			10.50%
CAPM	11.03%		1.02%	12.05%
CE	12.80%			12.80%
Mr. Moul's Recommended Cost of Equity				10.95%

Source: Mr. Moul's Direct Testimony, Schedule 1, page 2 of 2.

⁶⁵ Mr. Moul's Direct Testimony, Schedule 1

⁶⁶ Mr. Moul's Direct Testimony, page 5, lines 8-10.

⁶⁷ Mr. Moul's Direct Testimony, page 23, lines 7-15.

1 **Q. DO THE RESULTS OF MR. MOUL'S COST OF EQUITY MODELS PROVIDE A**
2 **RELIABLE INDICATION OF PWR'S COST OF EQUITY?**

3 **A.** No. Even before adding the leverage adjustment to his DCF result (9.44%) and a size
4 premium to his CAPM result (11.03%), his model results are inflated because his models
5 are based on a non-market-based methodology that violates the purpose of rate of return
6 regulation as stated by the U.S. Supreme court:

7 The return to the equity owner should be commensurate with returns on
8 investments in other enterprises having corresponding risks.⁶⁸

9 Since investors can only earn a return on the market price of securities, this return
10 requirement must be market-based. Similarly, investors of regulated utilities cannot earn
11 a return on forecasted interest rates, authorized ROEs, or accounting returns.

12 Additionally, each of his cost of equity models has specific issues that contribute
13 to his unreasonably high results. First, I will address how his constant growth DCF method
14 is unreliable because it mechanically uses analyst 5-year EPS growth rates as a proxy for
15 growth without considering the mathematical relationship between retention rates,
16 dividend payments, and growth. A company cannot invest and grow with money it has
17 paid out to investors as a dividend. Second, I will explain how his CAPM model overstates
18 the cost of equity. Third, I will discuss the flaws with his RP model. Finally, I will explain
19 why his CE method should be disregarded because it is not a market-based method.
20

⁶⁸ *Federal Power Commission v. Hope Natural Gas Company* 320 U.S. 591, 603 (1944).

A. DCF Method

Q. WHAT FORMULA DOES MR. MOUL USE IN HIS DCF ANALYSIS?

A. Dividend Yield (D/P) + Growth Rate (g) + leverage Adjustment (lev).⁶⁹

Q. DOES MR. MOUL PROPERLY APPLY THE SIMPLIFIED OR CONSTANT DCF METHOD?

A. No. Mr. Moul correctly explains that “A fundamental growth rate analysis is frequently based upon internal growth ($b \times r$), where “r” is the expected rate of return on common equity and “b” is the retention rate (a fraction representing the proportion of earnings not paid out as dividends).”⁷⁰ His constant growth DCF method is not based on internal growth as measured by the fraction of earnings paid out as dividends, however. The correct application of the DCF method requires that the dividend yield be computed properly, and that the growth rate used be derived from a careful study of the future *sustainable* growth in cash flow anticipated by investors. As discussed in Section II above, major financial institutions like J.P. Morgan Chase do not use a growth rate based on analyst 5-year EPS growth rates, as Mr. Moul has done.

Q. HOW DID MR. MOUL CALCULATE HIS GROWTH RATE FOR HIS DCF METHOD?

A. On page 22, lines 10-11 of Mr. Moul’s testimony he says “...IBES/First Call, Zacks, and Value Line, provide the best indication of investor expectations.”⁷¹ Mr. Moul states, “DCF growth rates should not be established by a mathematical formulation, and I have not done

⁶⁹ Mr. Moul’s Direct Testimony, page 27, lines 13-14.

⁷⁰ Mr. Moul’s Direct Testimony, page 17, lines 11-14.

⁷¹ Mr. Moul’s Direct Testimony, page 22, lines 10-11.

1 so. In my opinion, a growth rate of 7.50% is a reasonable estimate of investor-expected
2 growth of the Water Group.”⁷² Below are the five-year projected earnings per share rates
3 by the four investment research firms he chose:

4 IBES/First Call: 6.31%

5 Zacks: 7.15%

6 Value Line: 7.93%

7 Mr. Moul’s 7.50% growth rate is significantly higher than average growth rate for
8 book value per share (4.29%) for the 8 water utility companies in his proxy group. As
9 discussed below, Mr. Moul’s constant growth DCF result of 9.44% (10.41% after adding
10 his leverage adjustment), is above investors’ returns expectations because he does not
11 account for the difference between the growth rate forecasts of earnings per share and book
12 value per share.

13 **Q. IS MR. MOUL’S METHODOLOGY TO DETERMINE THE GROWTH RATE TO**
14 **USE IN HIS DCF MODEL APPROPRIATE?**

15 **A.** No. Mr. Moul mentions the “b x r” method on pages 17-18 of his direct testimony but he
16 does not use it. As stated above, Mr. Moul uses analyst five-year earnings per share growth
17 without attempting to reconcile the retention rate used for computing growth with the
18 retention rate he used to compute the dividend yield. This is analogous to failing to
19 reconcile the money you are taking out of your checking account with your future balance,
20 i.e., the basic balancing of a checkbook.

⁷² Mr. Moul’s Direct Testimony, page 22, lines 14-15.

1 **Q. CAN YOU PLEASE SUMMARIZE WHY A FUTURE ORIENTED “B X R”**
2 **METHOD IS SUPERIOR TO A FIVE-YEAR EARNINGS PER SHARE GROWTH**
3 **RATE FORECAST IN PROVIDING A LONG-TERM SUSTAINABLE GROWTH**
4 **RATE?**

5 **A.** Yes. The primary cause of sustainable earnings growth is the retention of earnings. A
6 company can create higher future earnings by retaining a portion of the prior year's
7 earnings in the business and purchasing new business assets with those retained earnings.
8 There are many factors that can cause short-term swings in earnings growth rates, but the
9 long-term sustainable growth is caused by retaining earnings and reinvesting those
10 earnings. Factors that cause short-term swings include anything that causes a company to
11 earn a return on book equity at a rate different from the long-term sustainable rate.
12 Assume, for example, that a particular utility company is regulated so that it is provided
13 with a reasonable opportunity to earn 9.0% on its equity. If the company should experience
14 an event such as the loss of several key customers, or unfavorable weather conditions which
15 cause it to earn only 6.0% on equity in a given year, the drop of 9% earned return on equity
16 to a 6% earned return on equity would be concurrent with a very large drop in earnings per
17 share. In fact, if a company did not issue any new shares of stock during the year, a drop
18 from a 9% earned return on book equity to a 6% earned return on book equity would result
19 in a 33.3% decline in earnings per share over the period.⁷³ However, such a drop in
20 earnings would not be any indication of what is a long-term sustainable earnings per share
21 growth rate. If the drop were caused by weather conditions, the drop in earnings would be

⁷³ By definition, earned return on equity is earnings divided by book value. Therefore, whatever level of earnings is required to produce earnings of 6% of book would have to be 33.3% lower than the level of earnings required to produce a return on book equity of 9%.

1 immediately offset once normal weather conditions return. If the drop were from the loss
2 of some key customers, the company would replace the lost earnings by filing for a rate
3 increase to bring revenues up to the level required for the company to be given a reasonable
4 opportunity to recover its cost of equity.

5 For the above reasons, changes in earnings per share growth rates that are caused
6 by non-recurring changes in the earned return on book equity are inconsistent with long
7 term sustainable growth, but changes in earnings per share because of the reinvestment of
8 additional assets is a cause of sustainable earnings growth. The “ $b \times r$ ” term in the DCF
9 equation computes sustainable growth because it measures only the growth which a
10 company can expect to achieve when its earned return on book equity “ r ” remains in
11 equilibrium. If analysts have sufficient data to be able to forecast varying values of “ r ” in
12 future years, then a complex, or multi-stage DCF method must be used to accurately
13 quantify the effect. Averaging growth rates over sub-periods, such as averaging growth
14 over the first five years with a growth rate expected over the subsequent period, will not
15 provide an appropriate representation of the cash flows expected by investors in the future
16 and, therefore, will not provide an acceptable method of quantifying the cost of equity
17 using the DCF method. The choices are either a constant growth DCF, in which one “ $b \times$
18 r ” derived growth rate should be used, or a complex DCF method in which the cash flow
19 anticipated in each future year is separately estimated. Mr. Moul has done neither.

20 **Q. WHY ARE ANALYSTS FIVE-YEAR CONSENSUS GROWTH RATES NOT**
21 **INDICATIVE OF LONG-TERM SUSTAINABLE GROWTH RATES?**

22 **A.** Analysts’ five-year earnings per share growth rates are earnings per share growth rates that
23 measure earnings growth from the most currently completed fiscal year to projected

1 earnings five years into the future. These growth rates are not indicative of future
2 sustainable growth rates in part because the sources of cash flow to an investor are
3 dividends and stock price appreciation. While both stock price and dividends are impacted
4 in the long-run by the level of earnings a company is capable of achieving, earnings growth
5 over a period as short as five years is rarely in synchronization with the cash flow growth
6 from increases in dividends and stock prices. For example, if a company experiences a
7 year in which investors perceive that earnings temporarily dipped below normal trend
8 levels, stock prices generally do not decline at the same percentage that earnings decline,
9 and dividends are usually not cut just because of a temporary decline in a company's
10 earnings. Unless both the stock price and dividends mirror every down swing in earnings,
11 they cannot be expected to recover at the same growth rate that earnings recover.
12 Therefore, growth rates such as five-year projected growth in earnings per share are not
13 indicative of long-term sustainable growth rates in cash flow. As a result, they are
14 inapplicable for direct use in the simplified DCF method.

15 **Q. IS THE USE OF FIVE-YEAR EARNINGS PER SHARE GROWTH RATES IN**
16 **THE DCF MODEL ALSO IMPROPER?**

17 **A.** A raw, unadjusted, five-year earnings per share growth rate is usually a poor proxy for
18 either short-term or long-term cash flow that an investor expects to receive. When
19 implementing the DCF method, the time value of money is considered by equating the
20 current stock price of a company to present value of the future cash flows that an investor
21 expects to receive over the entire time that he or she owns the stock. The discount rate
22 required to make the future cash flow stream, on a net present value basis, equal to the
23 current stock price is the cost of equity. The only two sources of cash flow to an investor

1 are dividends and the net proceeds from the sale of stock at whatever time in the future the
2 investor finally sells. Therefore, the DCF method is discounting future cash flows that
3 investors expect to receive from dividends and from the eventual sale of the stock. Five-
4 year earnings growth rate forecasts are especially poor indicators of cash flow growth even
5 over the five years being measured by the five-year earnings per share growth rate number.

6 **Q. WHY IS A FIVE-YEAR EARNINGS PER SHARE GROWTH RATE A POOR**
7 **INDICATOR OF THE FIVE-YEAR CASH FLOW EXPECTATIONS FROM**
8 **DIVIDENDS?**

9 **A.** The board of directors changes dividend rates based upon long-term earnings expectations
10 combined with the capital needs of a company. Most companies do not cut the dividend
11 simply because a company has a year in which earnings were below sustainable trends, and
12 similarly they do not increase dividends simply because earnings for one year happened to
13 be above long-term sustainable trends. Therefore, over any given five-year period,
14 earnings growth is frequently very different from dividend growth. In order for earnings
15 growth to equal dividend growth, at a minimum, earnings per share in the first year of the
16 five-year earnings growth rate period would have to be exactly on the long-term earnings
17 trend line expected by investors. Since earnings in most years are above or below the trend
18 line, the earnings per share growth rate over most five-year periods is different from what
19 is expected for earnings growth.

20 **Q. WHY IS THE FIVE-YEAR EARNINGS PER SHARE GROWTH RATE A POOR**
21 **INDICATION OF FUTURE STOCK PRICE GROWTH?**

22 **A.** If a company happens to experience a year in which earnings decline below what investors
23 believe are consistent with the long-term trend, then the stock price does not drop anywhere

1 near as much as earnings drop. Similarly, if a company happens to experience a year in
2 which earnings are higher than the investor-perceived long-term sustainable trend, then the
3 stock price will not increase as much as earnings. In other words, the P/E (price/earnings)
4 ratio of a company will increase after a year in which investors believe earnings are below
5 sustainable levels, and the P/E ratio will decline in a year in which investors believe
6 earnings are higher than expected. Since it is stock price that is one of the important cash
7 flow sources to an investor, a five-year earnings growth rate is a poor indicator of cash
8 flow both because it is a poor indicator of stock price growth over the five years being
9 examined and is equally a poor predictor of dividend growth over the period.

10 **Q. ARE YOU SAYING THAT ANALYSTS' CONSENSUS EARNINGS PER SHARE**
11 **GROWTH RATES ARE USELESS AS AN AID TO PROJECTING THE FUTURE?**

12 **A.** No. Analysts' EPS growth rates are, however, very dangerous if used in a simplified DCF
13 without proper interpretation. While they are not useful if used mechanically as Mr. Moul
14 does, they can be useful in computing estimates of what earned return on equity investors
15 expect will be sustained in the future, and as such, are useful in developing long-term
16 sustainable growth rates, as I have done.

17 **Q. BESIDES GROWTH RATE, ARE THERE ANY OTHER DCF ANALYSIS INPUTS**
18 **THAT MR. MOUL HAS ESTIMATED INCORRECTLY?**

19 **A.** Yes. Mr. Moul made an unjustifiable "leverage adjustment."

1 **Q. PLEASE DESCRIBE THE LEVERAGE ADJUSTMENT PROPOSED BY MR.**
2 **MOUL IN THIS PROCEEDING.**

3 **A.** Mr. Moul has proposed a leverage adjustment addition to his DCF derived cost of equity,
4 stating “In order to make the DCF results relevant to the capitalization measured at book
5 value (as is done for rate setting purposes), the market-derived cost rate must be adjusted
6 to account for the difference in financial risk.”⁷⁴ He then goes on to say: “Because the rate-
7 setting process uses ratios calculated from a firm’s book value capitalization, further
8 analysis is required to synchronize the financial risk of the book capitalization with the
9 required return on the book value of the firm’s equity.”⁷⁵ Because of this alleged higher
10 financial risk, Mr. Moul recommends adding 0.97%⁷⁶ to the DCF derived cost of equity.

11 **Q. JUST BECAUSE THE MARKET VALUE CAPITAL STRUCTURE CONTAINS A**
12 **HIGHER PERCENTAGE OF COMMON EQUITY THAN BOOK VALUE**
13 **CAPITAL STRUCTURE, DOES THIS MEAN THE MARKET VALUE CAPITAL**
14 **STRUCTURE HAS LOWER FINANCIAL RISK THAN THE BOOK VALUE**
15 **CAPITAL STRUCTURE?**

16 **A.** No. Market value capital structure and book value capital structure are two completely
17 different ways of measuring the same thing. Concluding that a market value capital
18 structure is lower in risk because it contains more equity than the book value-based capital
19 structure for the same company is as inconsistent and illogical as claiming that a person
20 who weighs 150 pounds could lose weight simply by stepping on a scale that measures
21 weight in kilos instead of pounds. Financial risk is determined by a company’s ability to

⁷⁴ Mr. Moul’s Direct Testimony, page 23, lines 17-19.

⁷⁵ Mr. Moul’s Direct Testimony, page 24, lines 7-10.

⁷⁶ Mr. Moul’s Direct Testimony, page 27, line 13-14.

1 meet its cash flow obligations. For example, a common measure of financial risk is the
2 pretax interest coverage ratio. The interest coverage ratio is computed by dividing the sum
3 of interest expense and pre-tax income by interest expense. The pretax cover ratio is useful
4 because it gives bondholders a sense of how far earnings would have to decline before a
5 company would not be able to meet its interest payments. For example, if a company has
6 an interest coverage ratio of 3.0, this means that at its current earnings rate, its earnings
7 available for both payment of interest and pre-tax earnings, is three times as much as is
8 needed to make its interest payments. This number is not impacted by the difference
9 between book value and market value capital structure

10 **Q. DOES A DECLINE IN MARKET PRICE LOWER THE COVERAGE RATIO?**

11 **A.** Lowering of the market value does not directly cause a change in the coverage ratio
12 computation. Therefore, changing from a market value orientation to a book value
13 orientation does no more to change a company's financial risk than the weight of a person
14 was influenced by switching to a scale calibrated in kilos instead of pounds.

15 **Q. DO INVESTORS UNDERSTAND THAT AS PART OF THE REGULATORY**
16 **PROCESS ALLOWED RETURNS ARE APPLIED TO BOOK VALUE?**

17 **A.** Yes, they do. This is a process that has been going on for decades and it is hard to argue
18 that investors are not aware of this. By recommending this leverage adjustment, Mr. Moul
19 is implying that investors do not know how regulation works. For example, when a person
20 purchases a home, they understand that they will have to pay property taxes after they take
21 ownership and therefore if property taxes are higher in one state versus another they would
22 likely, all else equal, want to pay less for a home that has the higher tax rate. This is
23 analogous to an investor purchasing shares of a regulated utility stock. Investors

1 understand that authorized ROEs are applied to book value and therefore they decide how
2 much they are willing to pay for a stock based on the earnings and dividends they expect
3 to receive from this calculation. Therefore, the result of a DCF analysis does not need to
4 be adjusted to account for a regulatory process that investors understand.

5 **Q. DOES MR. MOUL’S LEVERAGE ADJUSTMENT GO AGAINST ORIGNAL**
6 **COST RATEMAKING?**

7 **A.** Yes. Mr. Moul claims, “The need for the leverage adjustment arises when the results of
8 the DCF model (k) are to be applied to a capital structure that is different than indicated by
9 the market price (P).”⁷⁷ In other words, Mr. Moul is saying that as a consequence of
10 original cost ratemaking, an upward adjustment is needed. When a company has a market-
11 to-book ratio above 1, it is true that applying the correct market-based COE to the book
12 value could have downward pressure on the stock price. However, no adjustment is needed
13 since the purpose of regulation is not to maintain the market value of a regulated utility
14 (the stock price in the case of a publicly traded company).

15 **B. CAPM Method.**

16 **Q. PLEASE SUMMARIZE MR. MOUL’S CAPM METHOD.**

17 **A.** Mr. Moul explains that, “To compute the cost of equity with the CAPM, three components
18 are necessary: a risk-free rate of return (“Rf”), the beta measure of systematic risk (“β”),
19 and the market risk premium (“Rm-Rf”) derived from the total return on the market of
20 equities reduced by the risk-free rate of return.”⁷⁸ He uses a risk free rate of 2.75% based

⁷⁷ Mr. Moul’s Direct Testimony, page 23, line 23 – page 24, lines 1-2.

⁷⁸ Mr. Moul’s Direct Testimony, page 32, lines 6-9.

1 on Blue Chip forecasts of long term Treasury yields.⁷⁹ His market premium portion of his
2 CAPM analysis (9.00%) is based on the forecasted S&P 500 returns. He adds a “small size
3 adjustment” of 1.02% to account for the relatively small size of PWR relative to the
4 companies in the Water Group.⁸⁰

5 **Q. DO YOU AGREE WITH THE RESULTS OF MR. MOUL’S CAPM ANALYSIS?**

6 **A.** No, I do not agree with results of Mr. Moul’s CAPM analysis because I believe it
7 significantly and inaccurately overstates the Company’s cost of equity.

8 The arithmetic average return that Mr. Moul uses overstates the historical risk
9 premium by nearly 200 basis points. The 2021 SBBI Yearbook shows that investors
10 actually earned a compounded annual return of 10.3%⁸¹ between 1926 and 2020. Mr.
11 Moul’s arithmetic mean return of 12.06%⁸² is possibly valuable to stockbrokers and fund
12 managers attempting to predict future bonuses, but not for calculating the cost of equity.

13 A Dow Jones Newswire article stated, “Some financial advisers rely too heavily on a
14 formula known as the arithmetic average, which can be misleading when investing for the
15 long term. Financial advisors who use this formula may be overstating your potential profit
16 and leading you to take risks you might otherwise avoid...”⁸³ Mr. Moul’s prospective risk
17 premium calculation is based on a DCF analysis that is not based on sustainable growth.

18 His DCF analysis for the S&P 500 has a growth component of an astounding 13.00%.⁸⁴

⁷⁹ Mr. Moul’s Direct Testimony, page 34, lines 17-18.

⁸⁰ Mr. Moul’s Direct Testimony, page 36, lines 2-3.

⁸¹ Ibbotson SBBI® 2021 Classic Yearbook, page 2-23.

⁸² Mr. Moul’s Direct Testimony, Schedule 12, page 1 of 2 and Schedule 13, page 2 of 3.

⁸³ Kaja Whitehouse, To Financial Advisors and Fuzzy Math, Dow Jones Newswires October 8, 2003.

⁸⁴ Mr. Moul’s Direct Testimony, Schedule 13, page 2 of 3.

Q. IS MR. MOUL’S ADDER FOR A SMALL SIZE EFFECT AN APPROPRIATE PART OF A CAPM ANALYSIS?

A. No. Mr. Moul states that technical literature from the 1980s and 1990s supports his claim that PWR’s COE should be increased by 1.02% because it is smaller than the water companies in his Water Group.⁸⁵ However, Mr. Moul’s conclusion that smaller firms require a higher COE is not supported by the evidence and therefore PWR’s consumers should not be charged higher rates because of its size. Mr. Moul uses data from the 2017 SBBI Yearbook to calculate his recommended 1.02% size premium. The 2021 SBBI Yearbook states the following regarding the theory that investors require higher returns to invest in smaller firms:

The size effect is not without controversy, nor is this controversy something new. Traditionally, small companies are believed to have greater required rates of return than large companies because smaller companies are inherently riskier. It is not clear, however, whether this is due to size itself, or to other factors closely related to or correlated with size...⁸⁶

Many scholars have expressed concerns with the results of older studies (1980s and 1990s) that found that smaller companies have higher required returns. Professor Aswath Damodaran said the following regarding the supposed “small cap premium:”

Even if you believe that small cap companies are more exposed to market risk than large cap ones, this is an extremely sloppy and lazy way of dealing with that risk, since risk ultimately has to come from something fundamental (and size is not a fundamental factor).⁸⁷

⁸⁵ Mr. Moul’s Direct Testimony, page 35, lines 11-23 and page 36, lines 1-3.

⁸⁶ Ibbotson SBBI® 2021 Classic Yearbook, page 7-2.

⁸⁷ Aswath Damodaran, Equity Risk Premiums (ERP): Determinates, Estimation and Implications – The 2014 Edition (paper updated, March 2015) page 42.

1 **Q. HAVE RECENT STUDIES FOUND THAT THE RELATIONSHIP BETWEEN**
 2 **SIZE AND EXPECTED RETURN IS WEAK?**

3 **A.** Yes. A 2018 study conducted by scholars at AQR Capital Management and Yale
 4 University found that “the size effect diminished shortly after its discovery and
 5 publication.”⁸⁸ The authors of this research found that data errors plagued the early studies
 6 regarding the relationship between firm size and return. They found that the data in the
 7 earlier studies did not include delisted companies and since smaller firms are delisted more
 8 often than larger stocks, the biased data (referred as a “delisting bias”) made the returns of
 9 smaller stocks look higher than reality.⁸⁹ In light of this recent data, Mr. Moul’s adder for
 10 small size effect is not appropriate and should be disregarded.

11 **C. Risk Premium Method**

12 **Q. PLEASE EXPLAIN MR. MOUL’S VERSION OF THE RISK PREMIUM**
 13 **METHODS, AS PRESENTED IN HIS DIRECT TESTIMONY.**

14 **A.** Mr. Moul calculates an equity risk premium of large company stocks over long-term
 15 corporate bonds based on historical data between 1926-2020 and presents the results in
 16 three categories based on the relative level of interest rates.

17 **Category Equity Risk Premium:**

18 **Low Interest Rate 6.63%**

19 **Average Across All Interest Rates 5.67%**
 20
 21
 22
 23

⁸⁸ Ron Alquist, Ronen Israel, and Tobias Moskowitz, Fact, Fiction, and the Size Effect, *The Journal of Portfolio Management*, Fall 2018, page 3.

⁸⁹ Ron Alquist, Ronen Israel, and Tobias Moskowitz, Fact, Fiction, and the Size Effect, *The Journal of Portfolio Management*, Fall 2018, page 5.

1 High Interest Rates 4.69%⁹⁰

2

3 **Q. PLEASE COMMENT ON MR. MOUL’S RISK PREMIUM METHOD.**

4 **A.** Mr. Moul’s equity risk premium is flawed for two reasons. First, Mr. Moul uses a bond
5 yield of 3.75%⁹¹ in his analysis based on a projected yield of A-rated public utility bonds
6 instead of using the actual current market yields (2.73% - 3.44% for the twelve months
7 ended April 2021).⁹² As discussed throughout my testimony, the cost of equity should be
8 based on investors’ expectations as indicated by market data and not on “expert forecasts.”
9 Economists have been forecasting interest rates will rise for decades, but they have not.
10 Consumers should not be charged rates based on such completely unreliable forecasts. See
11 Chart 10 on page 59 for data demonstrating how inaccurate these forecasts have been.
12 Second, Mr. Moul’s claim there is an inverse relationship between the common equity risk
13 premium and interest rates is based on a flawed analysis that mismatches historical equity
14 returns and expected bond yields. See Schedule 12, page 2 of 2 of Mr. Moul’s Direct
15 Testimony.

16 **D. Comparable Earnings Method**

17 **Q. PLEASE EXPLAIN THE COMPARABLE EARNINGS METHOD PRESENTED**
18 **BY MR. MOUL.**

19 **A.** Mr. Moul selected a group of non-regulated companies that he believes to be of comparable
20 risk to the Water Group. After selecting the companies, he presents the historic and Value

⁹⁰ Mr. Moul’s Direct Testimony, page 31, lines 4-5.

⁹¹ Mr. Moul’s Direct Testimony, page 28, lines 8-12.

⁹² Mr. Moul’s Direct Testimony, page 28, lines 18-19.

1 Line expected return on book equity. See Schedule 14, page 2 of 3 of Mr. Moul's direct
2 testimony. The final column of numbers on this table is the "Projected 2024-26."
3 However, what he labels as the projected 2024-26 return is actually the return on book
4 equity that Value Line forecasts, not the return that Value Line projects investors will
5 receive on their investment as a result of purchasing the common stock at current prices.
6 According to Mr. Moul's Schedule 14, the total return expected by Value Line on the book
7 equity of these industrial companies is between a 6.50% and a high of 53%, for an average
8 of 17.3% (13.2% excluding companies with values > 20%).

9 **Q. IS THIS METHOD VALID?**

10 **A.** No. Mr. Moul has attempted to determine the cost of equity that would be demanded by
11 investors on the market price of a company comparable to PWR by comparing it to the
12 historic and projected returns on book equity of a selection of industrial companies.
13 Leaving aside the problems with actually being able to select companies that are
14 comparable, the overriding problem with Mr. Moul's comparable earnings analysis is that
15 it did not address the cost of equity at all. It simply considered the returns on book equity
16 that were achieved and are expected to be achieved by Value Line in the next 3 to 5 years.
17 The earned return on book equity is an entirely different concept from the cost of equity.

18 For this reason, a method based on return on book equity has recently been
19 discredited and eliminated from consideration in Federal Energy Regulatory Commission
20 (FERC) ROE proceedings. FERC determined it is not appropriate to use the Expected
21 Earnings model because "the record does not support departing from our traditional use of
22 market-based approaches to determine base ROE."⁹³ FERC goes on to say:

⁹³ FERC Opinion No. 569. Par 200.

1 In Hope, the Supreme Court explained that ‘the return to the equity owner
2 should be commensurate with returns on investments in other enterprises
3 having corresponding risks.’ In order to determine this, we must analyze the
4 returns that are earned on ‘investments in other enterprises having
5 corresponding risks,’ but investors cannot invest in an enterprise at book
6 value and must instead pay the prevailing market price for an enterprise’s
7 equity. As a result, the expected return on a utility’s book value does not
8 reflect ‘returns on investments in other enterprises’ because book value does
9 not reflect the value of any investment that is available to an investor in the
10 market, outside of the unlikely situation in which market value and book
11 value are exactly equal. Accordingly, we find that relying on the Expected
12 Earnings model would not satisfy the requirements of Hope.⁹⁴

13
14 As explained clearly by FERC, models based on return on book equity should be
15 excluded from consideration in this proceeding because it violates regulatory principles
16 that require the cost of equity to be market-based.

17 **Q. PLEASE SUMMARIZE YOUR ANALYSIS OF MR. MOUL'S TESTIMONY.**

18 **A.** Mr. Moul recommends that the Company be allowed a return on equity of 10.95%. Mr.
19 Moul’s DCF result of 10.41% is high because he adds a leverage adjustment that
20 misrepresents the basics of evaluating a company’s cost of equity. Without his leverage
21 adjustment and credit quality addition his DCF result is 9.44%. Mr. Moul’s Risk Premium
22 method was developed based upon an improper mathematical approach to quantifying
23 historic actual returns. Mr. Moul’s CAPM approach relies on invalid implementations of
24 the DCF method to quantify the projected cost of equity, an improper inflation of the “beta”
25 because of a high market-to-book ratio, and he adds the invalid “size premium.” The
26 incorrect claim that investors demand a higher cost of equity to invest in a small company
27 (referred to as “size premium”) is manufactured by an incorrect use of data. Mr. Moul’s

⁹⁴ FERC Opinion No. 569, par 201.

1 Comparable Earnings method is not really an equity costing method at all, as no
2 consideration was given to investor's reactions to the earned returns on book equity.

3 VII. CONCLUSION

4 **Q. PLEASE SUMMARIZE YOUR RECOMMENDATIONS IN THIS CASE.**

5 **A.** Based on the evidence presented in my testimony, I conclude that the cost of equity allowed
6 for the Company should be between 6.13% to 7.70% (recommended at the midpoint of
7 7.31%). Based on my recommended common equity ratio of 49.26%, that results in an
8 overall cost of capital of between 4.64% and 5.42% (recommended at 5.22%).

9 My recommendations satisfy the requirements of *Hope* and *Bluefield* that
10 regulated utility companies should have the opportunity to earn a return commensurate
11 with returns on investments in other enterprises having corresponding risks. My
12 recommendations are consistent with legal standards set by the United States Supreme
13 Court and market data and will allow PWR to raise capital on reasonable terms while
14 fulfilling its obligation to provide safe and reliable service.

15 **Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?**

16 **A.** Yes.